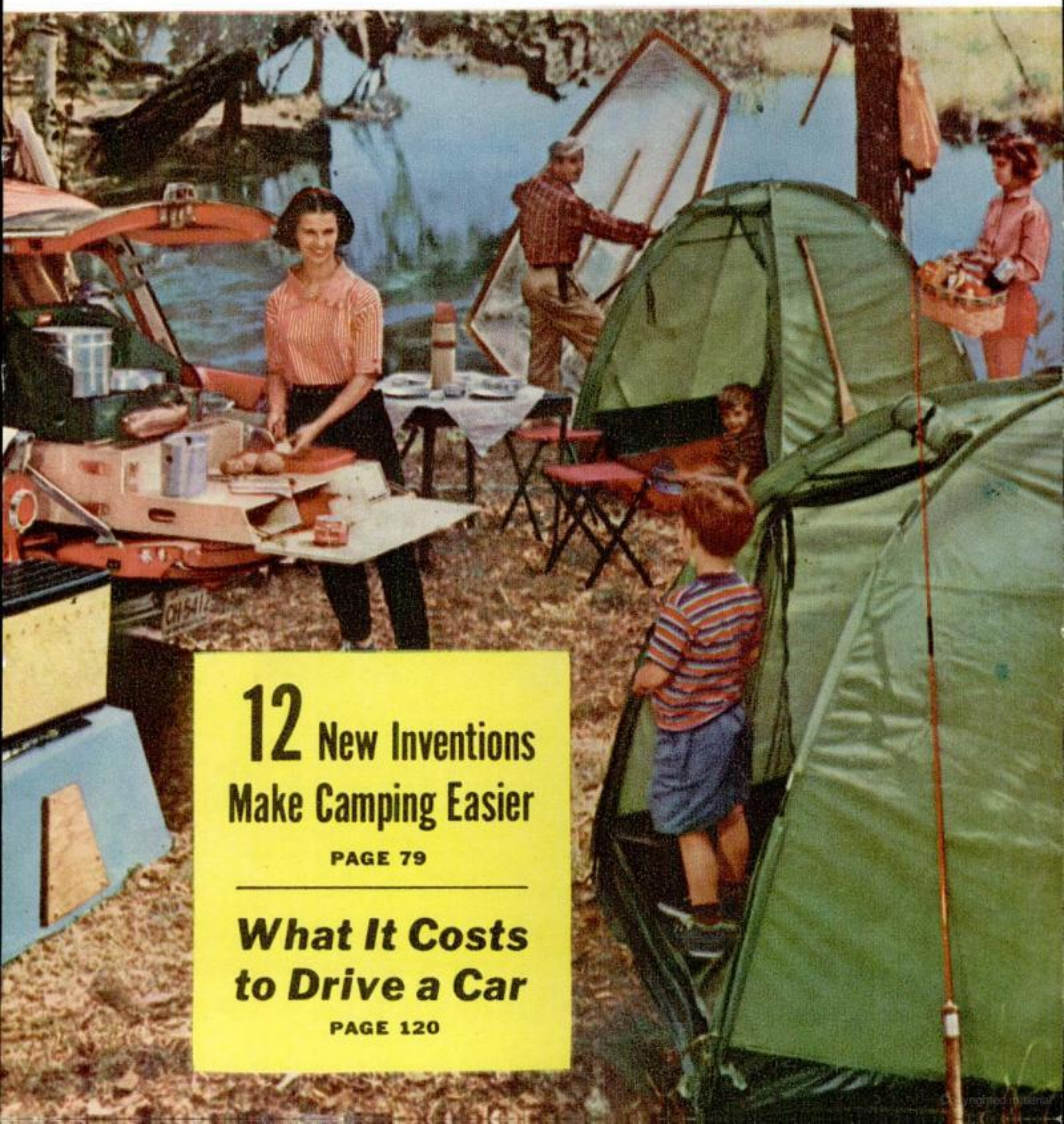


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POPULAR SCIENCE

June 35c

MONTHLY



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PAGE 79

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to Drive a Car**

PAGE 120

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JUNE, 1956

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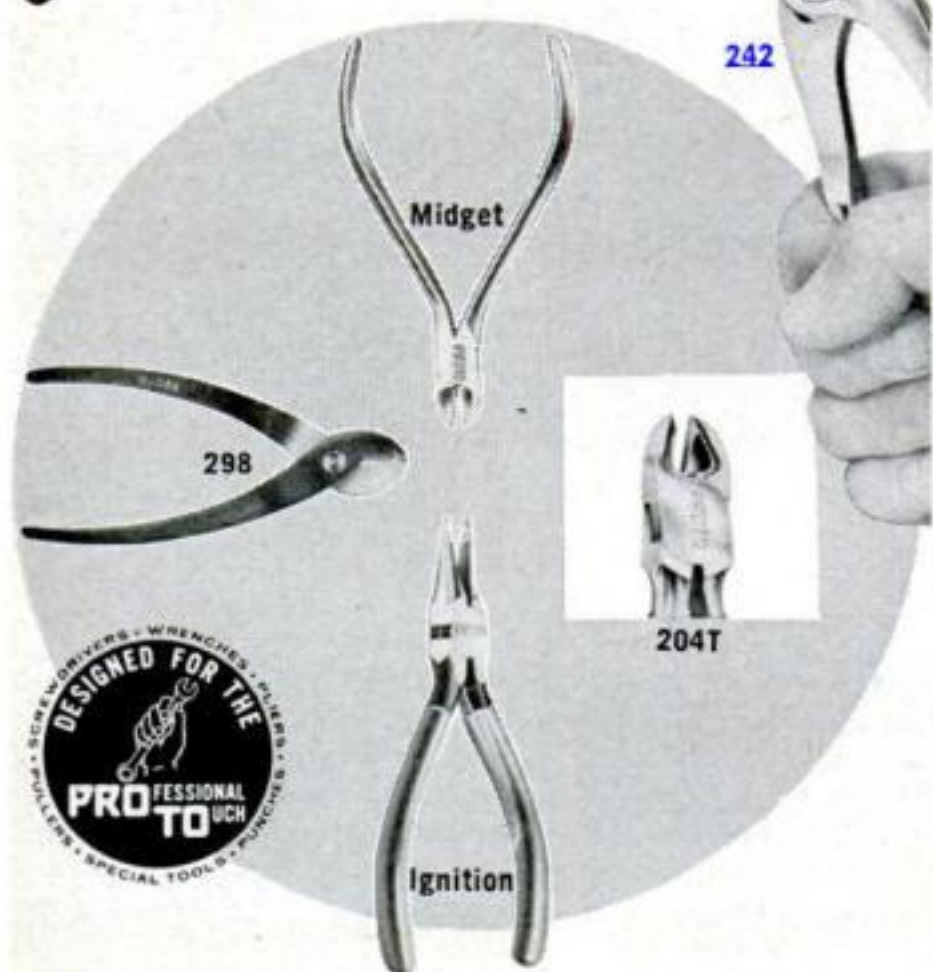
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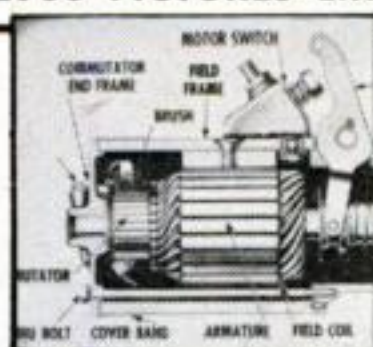


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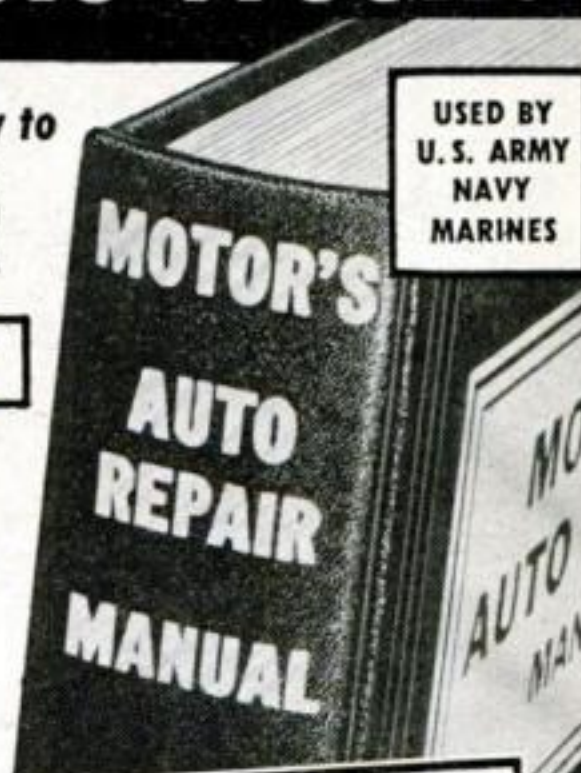
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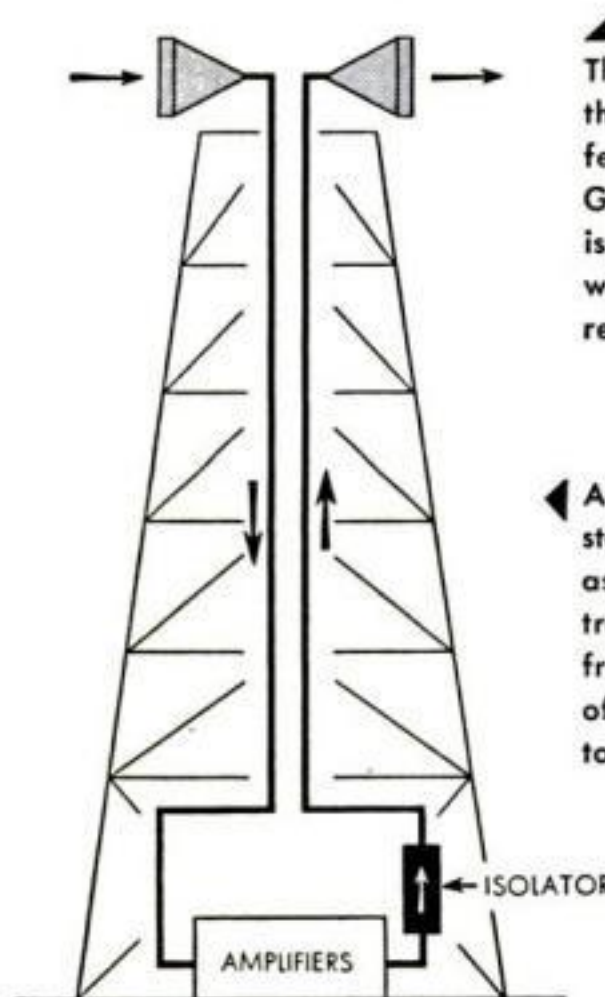
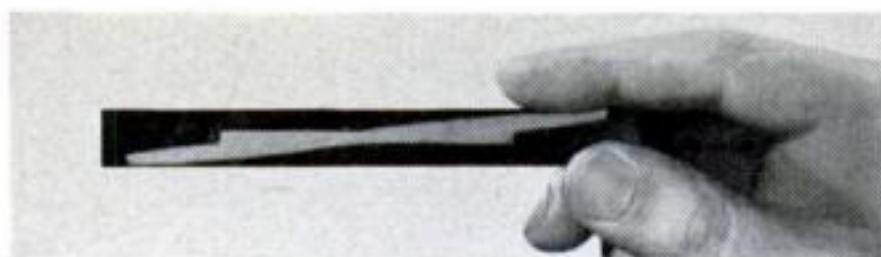
Dr. S. Weisbaum assembles an isolator which he developed for use in a new microwave system. Dr. Weisbaum is a Ph.D. in microwave spectroscopy from New York University. He is one of many young men at Bell Telephone Laboratories applying the insight of the physicist to develop new systems of communication.

New radio relay systems for telephone and television now in the making will employ an ingenious device invented by Bell scientists. The device, known as an "isolator," senses which way microwaves are traveling in a waveguide, and stops those going the wrong way.

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This is another example of how Bell Telephone Laboratories research works to improve American telephony and telecommunications throughout the world.



▲ The heart of the isolator is a ferrite slab. Geometric pattern is a carbon layer which dissipates reflected signals.

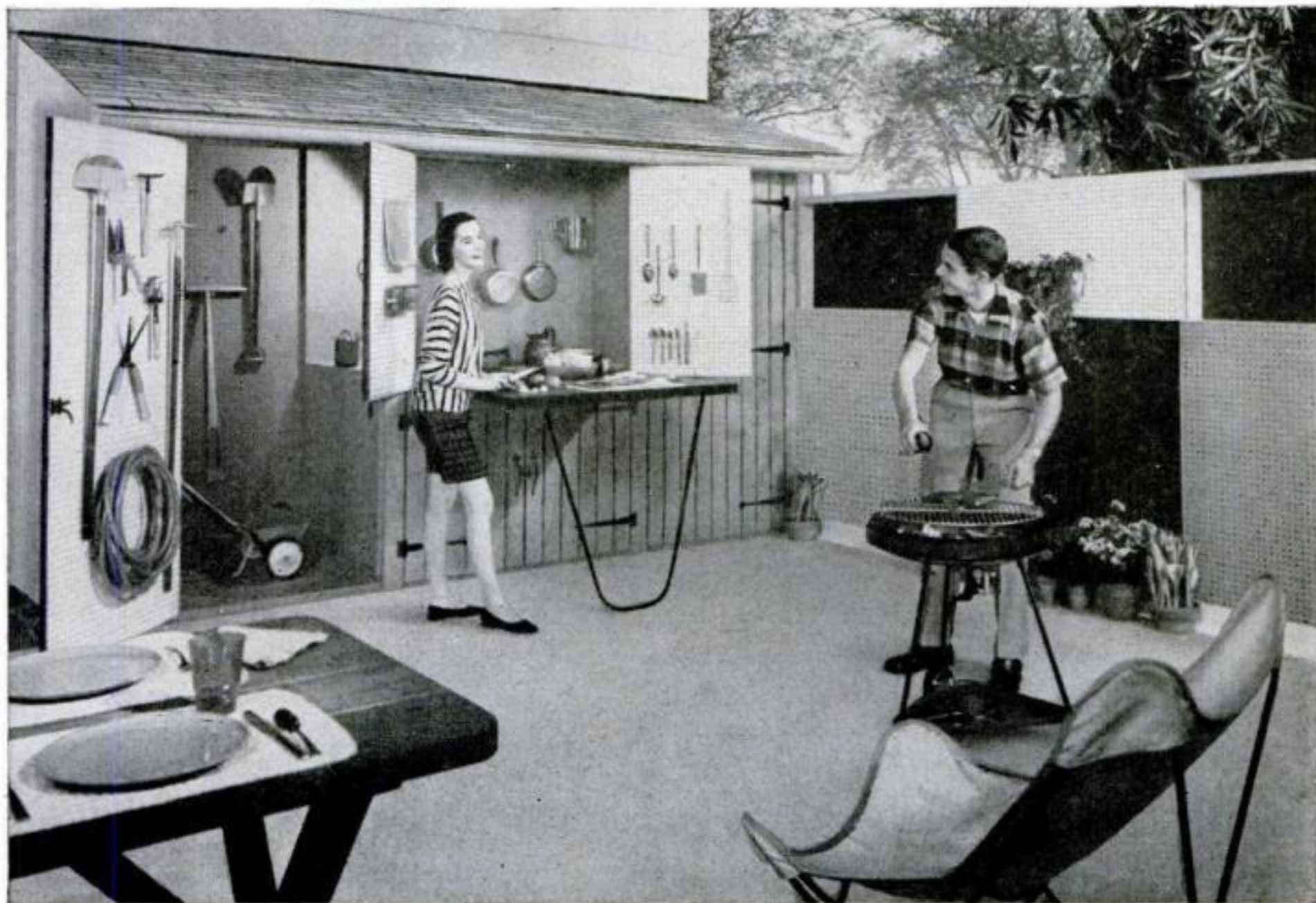
◀ At a radio relay station an isolator assures one-way transmission from the output of the amplifier to the antenna.

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Letters



Can You Identify These Plates?

My current hobby as an amateur photographer is collecting those advertising slogans and pictures that now appear on many automobile license plates. Here are a few that other POPULAR SCIENCE readers may



have fun trying to identify if you print them with the names painted out. [Editor's note: Answers on page 12.]

Some of these I got by keeping an eye peeled for out-of-state plates in the parking lots at an Air Force base and an Army hospital near here, knowing that military people get transferred quite often. The ones

Look *Forward* to carefree summer driving



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PARTS DIVISION

JUNE 1956 ||

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CRESCENT TOOL COMPANY, JAMESTOWN, N. Y.

with just zeros for numbers are samples that I obtained by writing to motor-vehicle bureaus.

J. B. Guss, Denver

The license plates pictured on page 10 are, from top to bottom, those of: North Dakota, Georgia, Ontario, Wyoming, Alaska and Illinois.

In Defense of Hot-Rodders

I object to Lt. Rambow's slighting reference to the "back-alley hot-rodder" in your letters column for April [p. 20]. For his information, a true hot-rodder is not a person with "several carburetors and the



largest megaphone exhaust on the market."

A hot-rodder is a person who is interested in achieving the utmost in mechanical perfection. Multiple carburetion is only one way of increasing the efficiency of an automobile engine.

WARREN KIRKLAND, Winnetka, Ill.

Will U. S. Appliances Work Abroad?

Your reassuring answer to the Navy man who wanted to take his household appliances abroad missed a point [Feb., p. 20]. Doesn't the automatic washer have an electric-clock-like timer to control the cycling? Won't it take 60 minutes for every 50 minutes' worth of work if you run it on 50-cycle current instead of 60?

DONALD H. ROGERS, Ivyland, Pa.

You're right. To maintain proper cycling on such things as clothes washers and dishwashers, it would be necessary to replace the rotor or the gear train in the timer with one designed for 50-cycle operation.

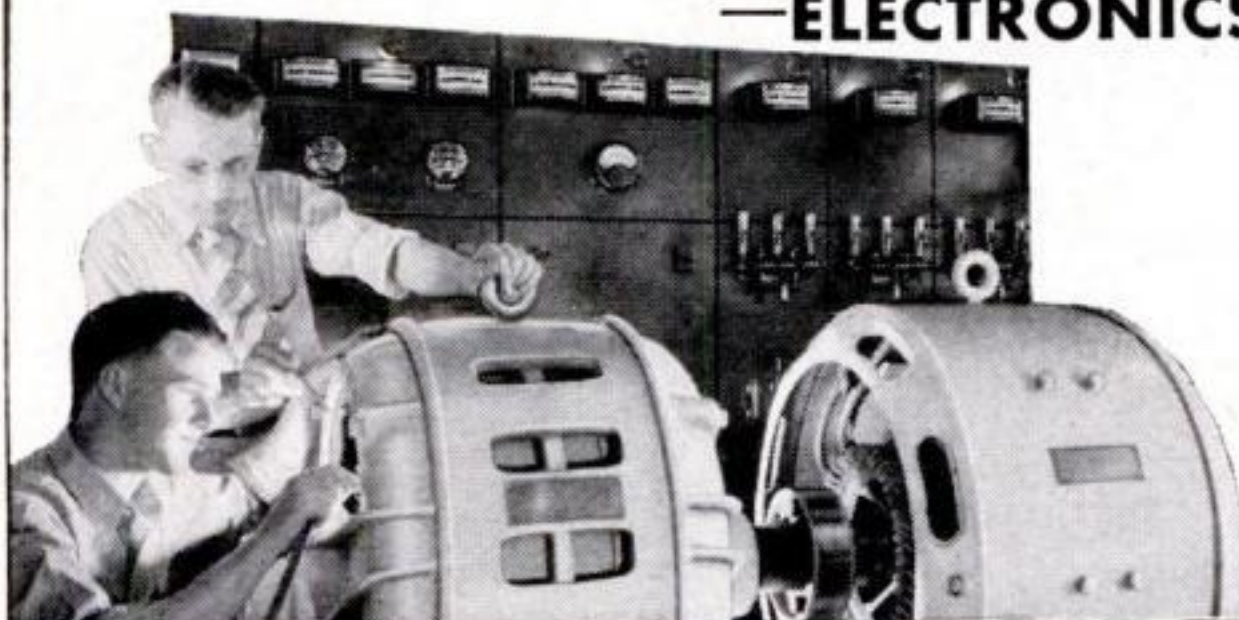
Note on the Good Old Days

I guess they aren't making elk-horn chairs the way they used to. The chair you showed [Jan., p. 92] doesn't look as substantial as the one that was presented to Abe Lincoln on Nov. 26, 1864, by Seth Kinman, a noted California trapper. I have an original Brady photograph of the Kinman job.

ABE BRAYER, Bronx, N. Y.

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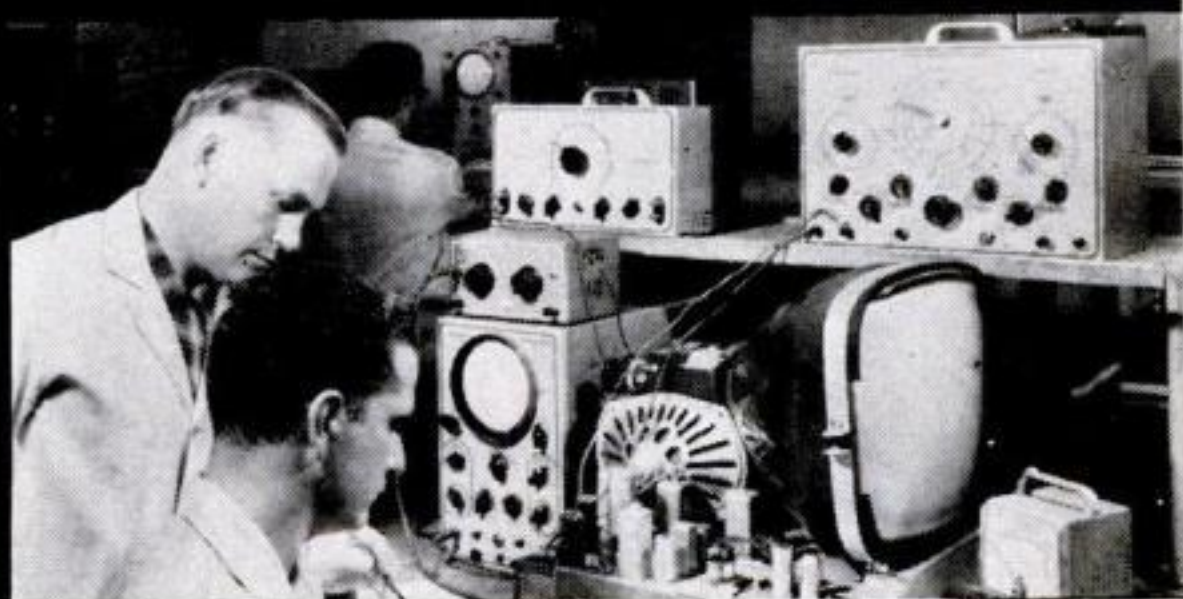
(Shown at left—Instructor explaining operation and testing of a large Motor Generator in our A.C. Department.)

AND **TELEVISION-RADIO**

On Real:

**TELEVISION
RECEIVING SETS
Including Color TV
AM and FM RADIO
RECEIVERS including
AUTO RADIOS
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(Right — Instructor helping students check the wiring and trace circuits of television receivers.)



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JUNE 1956 13

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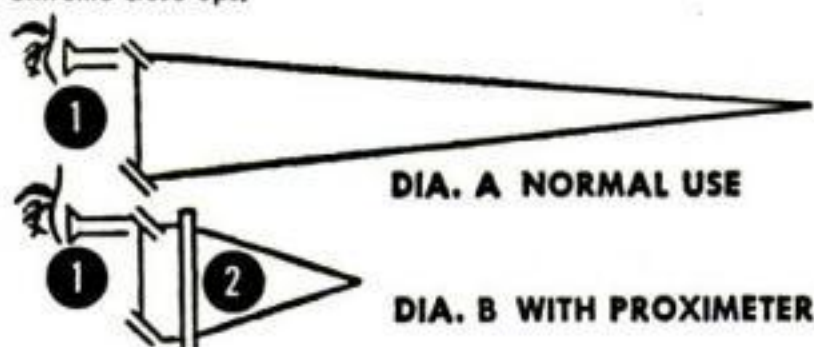
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DIAGRAM A: Rangefinder (1) normally focuses upon subjects as close as 3 feet.

DIAGRAM B: Lens segment (2) in front of rangefinder bends light rays from subject, allowing rangefinder focusing for extreme close-ups.



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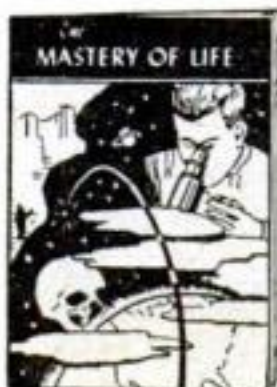
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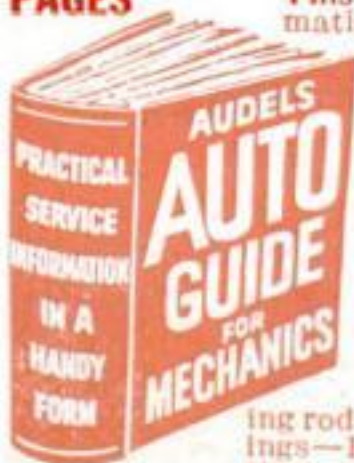
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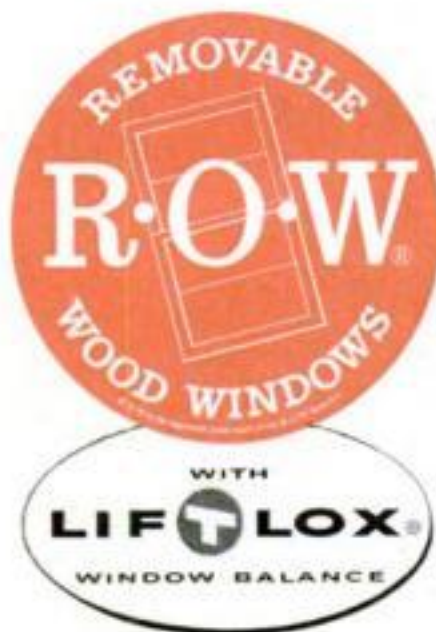
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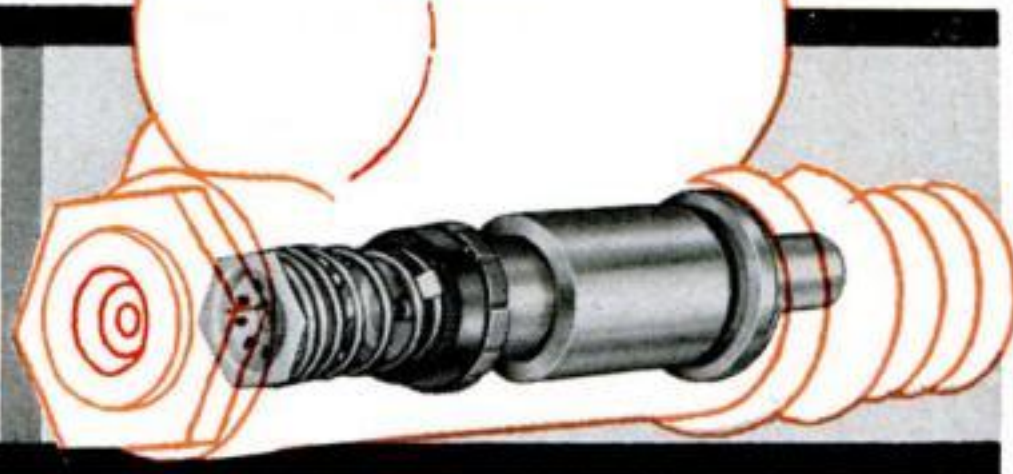
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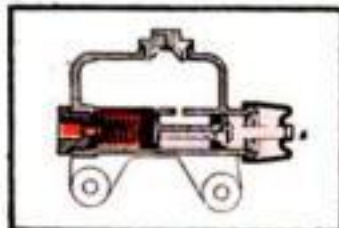
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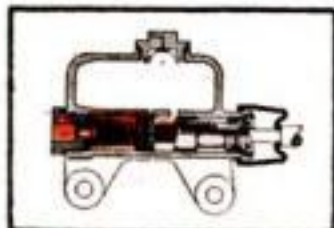
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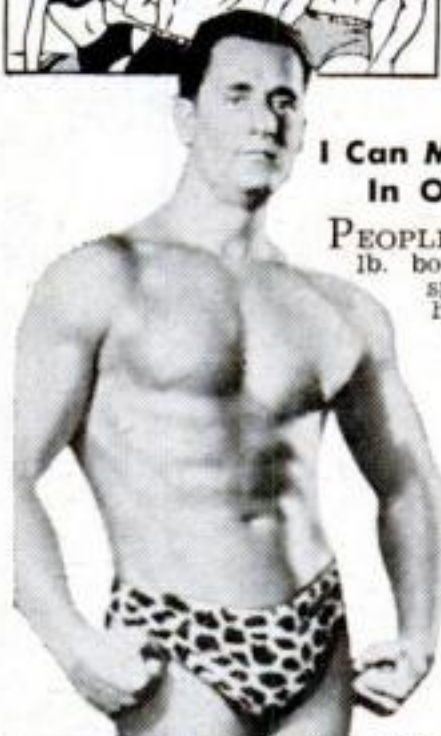
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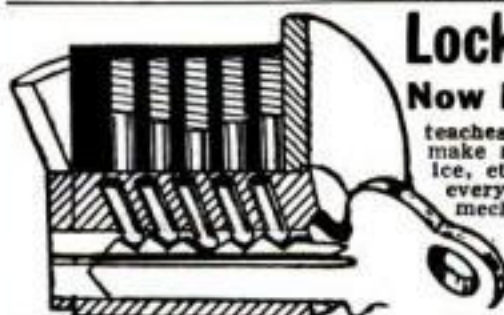
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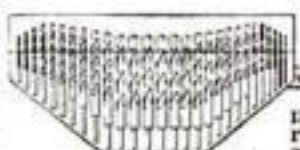
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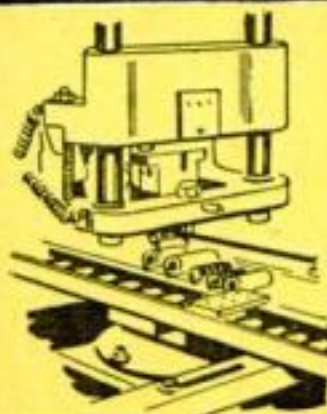
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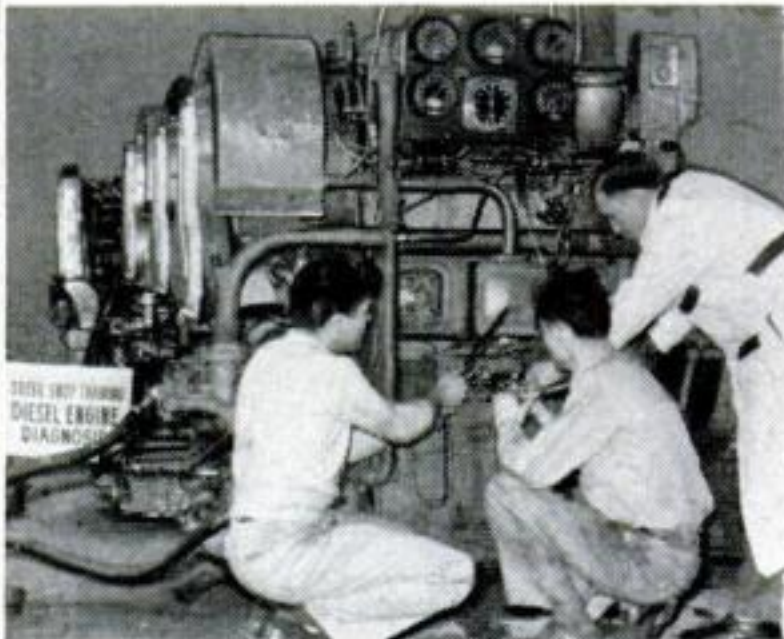
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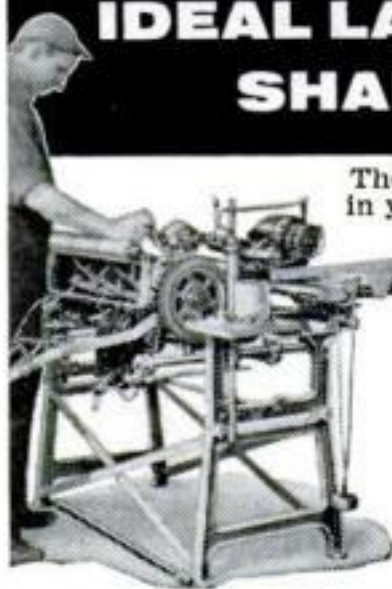
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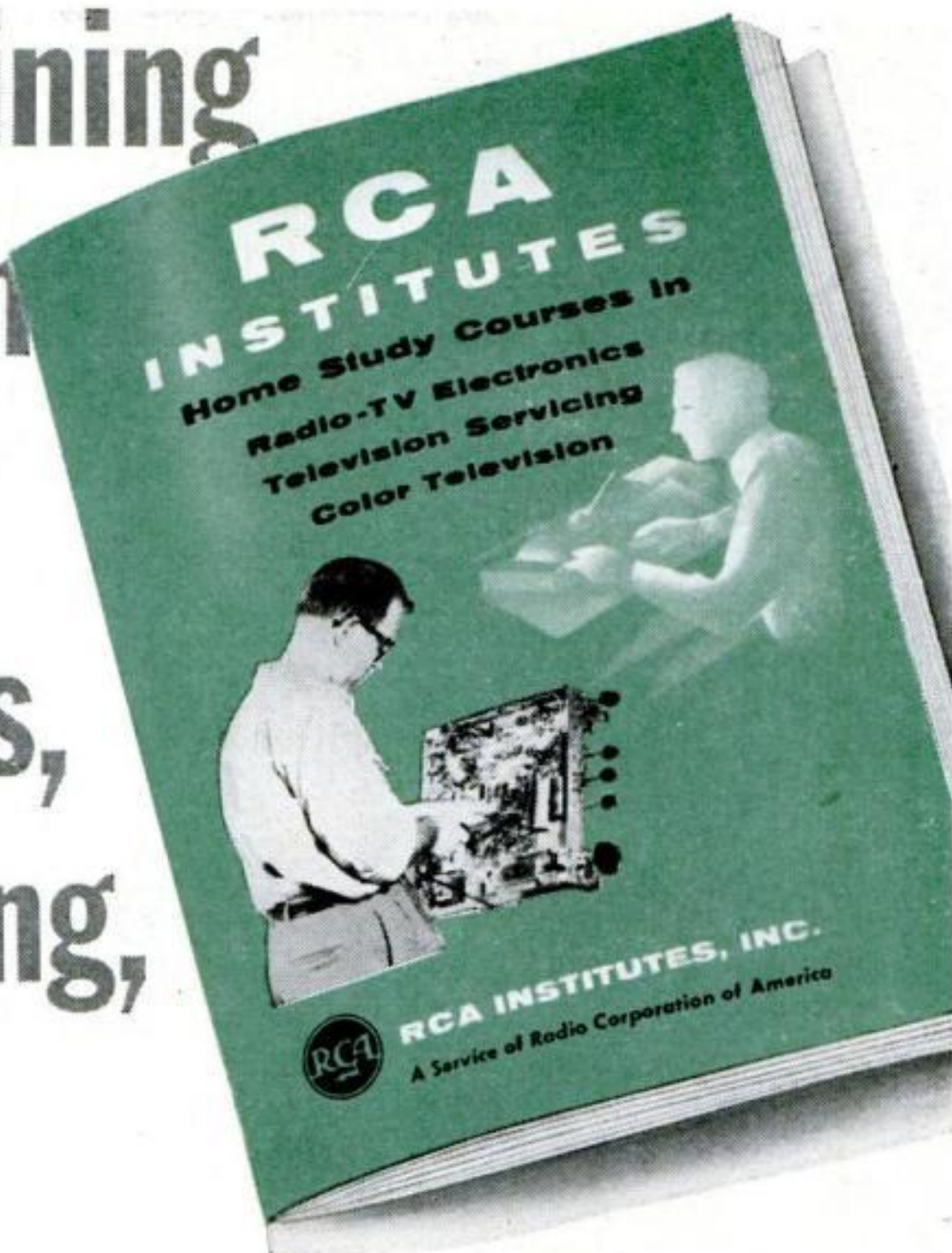


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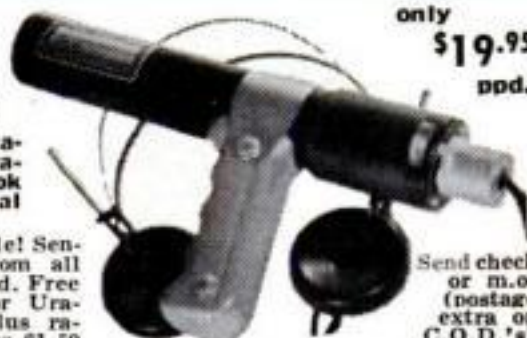
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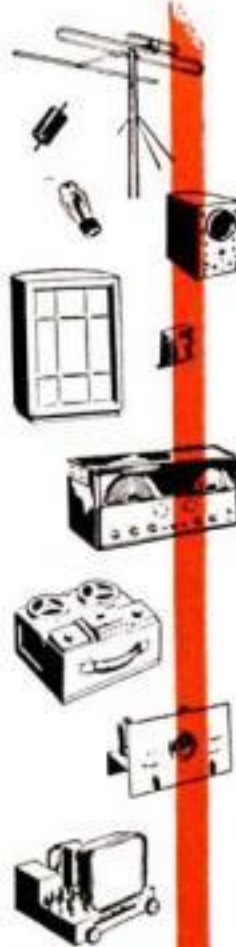
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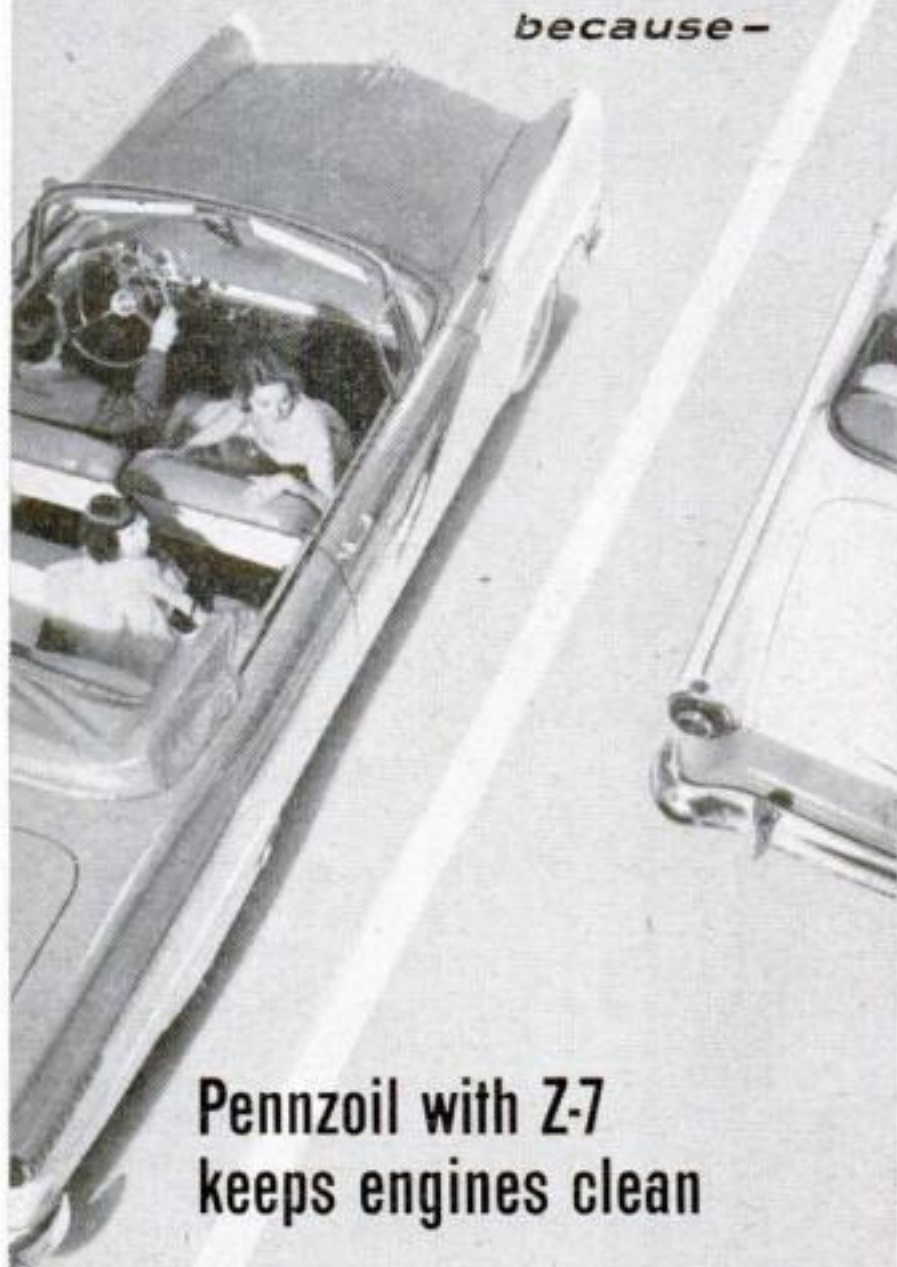
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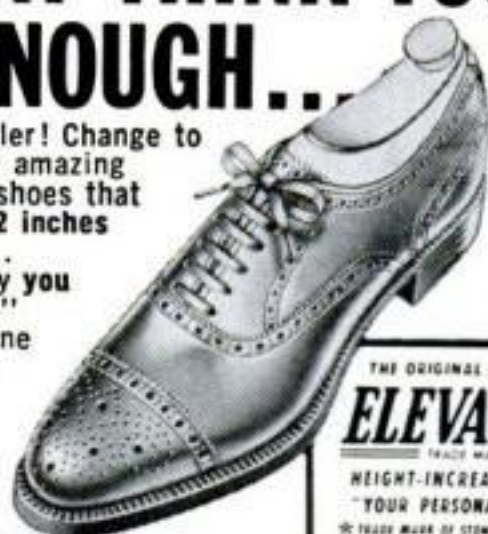


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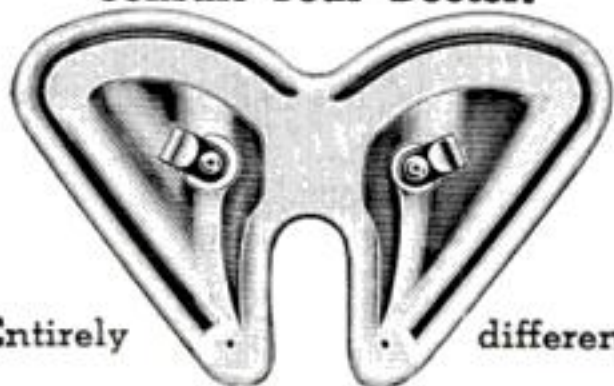
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SELLING 50,000 Indian Relics, arrowheads, etc. List free. Lear's, Glenwood, Arkansas.

3 WAR Arrowheads, Scalping Knife \$2.00. List Free. Arrowhead, Box 1249, Hot Springs, Arkansas.

ARROWHEADS, assorted: Thirty \$5.00, hundred \$15.00. Catalog 50c. Tilton Relics, Topeka 10, Kansas.

FOUR Select Arrowheads \$1.00. Spear \$1.00. Axe \$2.75. Celt \$1.50. Palmer, 435 Washington Road, McKeesport, Pa.

30 MINERALS & PRECIOUS STONES

LARGEST gem and mineral magazine tells how to have profitable fun with rocks, gems, jewelry. Monthly. \$3.00 year. Sample 25c. Gems & Minerals, Dept. S-6, Palmdale, Calif.

GEMCUTTING—Silvercraft magazine. Learn to cut gems, make jewelry. Ads give sources equipment, gems for cutters, collectors. Free literature. Sample copy 25c. Lapidary Journal, Del Mar 3, California.

GOLD, Silver, Copper Ore and Catalog 50c. Gemco, Elsner Ave., Sheboygan, Wisconsin.

HIGGENS' Gems & Minerals. Finest quality. Free price list. 2117 Park, Salem, Oregon.

SAPPHIRE, Topaz, tourmaline, garnet, peridot. Five uncut gem specimens, \$1.00. Ten polished gems, baroque shaped, \$1.00. Free big bargain list jewelry, gems, profitable, easy, do it yourself projects. O'Brien's, 1116B Wilcox, Hollywood 38, California.

TWENTY-five minerals plus Geology booklet \$2.00. Ten polished baroque gems \$1.00. Free price list. Money-back guarantee. Reed's, 4930 Palo Alto SE, Albuquerque, New Mexico.

GEMSTONES. Mineral specimens for cutters and collectors. Every variety. Lowest prices. Free catalog. Plummer's, 4720 Point Loma Avenue, San Diego 7, California.

Wood \$1.00. John Selmar, 1015 Atkin Avenue, Salt Lake City, Utah.

31 HOBBIES, COLLECTIONS

INVENTING can be an interesting and profitable hobby. Write for complete particulars. Institute of American Inventors, Dept. 30-E, 631-E St., N. W., Washington 4, D. C.

65 ASSORTED Army Patches, Insignias, Ribbons \$1.00. Surprise included. Lhgco, 19-Y East 16 St., New York City 3, N.Y.

25 DIFFERENT matchbook covers from Fabulous Las Vegas! Collector's items; only \$2.00 prepaid. George's Match Service, 721 Fremont Street, Suite 6, Las Vegas, Nevada.

GIANT roaring sea Shell also 30 others, each different. Ideal for collectors, jewelry, novelties, aquariums. Send \$3.00 to: Florida Novelties, 410½ Memorial Highway, Tampa 9, Florida.

HOBBIES, Crafts and Models Catalog 10c. Daters, 821 Divisadero Street, San Francisco 17, California.

MINIATURES, Insignia, Flags, Catalogs 35c. Griffin, Gray, A5, 72-05 67th Street, Glendale 27, New York.

WANTED — Cigarette, tobacco cards. Write Charles Bray, East Bangor, Penna.

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GROW Giant crystals! Send dime for booklet explaining hobby. Crystocraft Co., College Station, Texas.

MATCHBOOKS for collectors, catalog 25c. Charles Edelman, 1311-P East 84, Cleveland 3, Ohio.

NAZI Insignia. 12 Different. \$1.00. Arm-bands, daggers, flags, medals. Illustrated lists. Medcrafts, 1923 34th St., S.W., Calgary, Canada.

GENUINE Nazi badge 50c; Iron Cross with ribbon, \$1.50. 20 different American Emblems, 50c; New Catalog, 10c. Hobby-guild, Box 71 B, Station "A", Brooklyn, New York.

32 PHOTO FINISHING, PHOTOCOPIES, ETC.

SURPRISE gift with first roll developed. 8 jumbo superpak album prints or 16 contact prints 40c. 12 exposure roll 50c. Certificate for 3-5x7 enlargements. Dept. B-14, Owl Photo Co., Weatherford, Okla.

FREE 5"x7" introductory enlargement with roll. Finest quality Jumbo dated prints in handy Super paks. 8 exposures 35c; 12, 55c. Globe Photo, Dept. PS, Box 3508, St. Paul, Minnesota.

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PARTICULAR? 8 Jumbos, 35c; 12-50c. Special: 35mm, 36 exp. \$1.25. Flash Foto, Box 36H, Brooklyn 4, N.Y.

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34 CAMERAS, PHOTO SUPPLIES

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POEMS Wanted for New Songs. Send poems. Immediate consideration. Crown Music Company, 1472-P Broadway, New York City 36.

FREE Records of your song—Your words—My Melody. Free information. Johnny Mack's Melody Mart, 1094 West 39th Street, Dept. K, Los Angeles 37.

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SONGWRITERS! Send poems, songs. Music Service, 243 West 72nd St., PS, New York 23.

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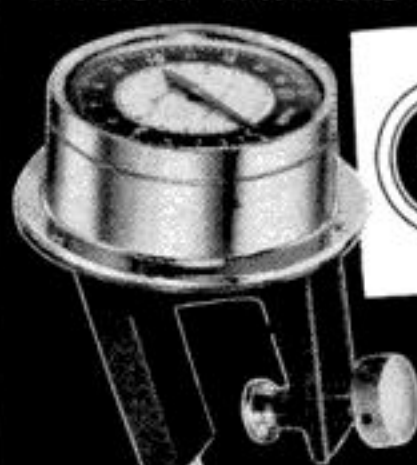
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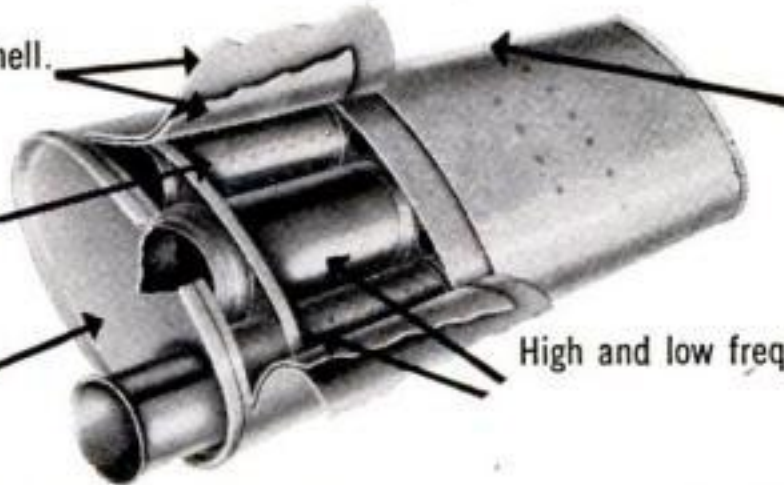
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Craftsmen At Work



Models in Bulbs. Robert Searight of Long Beach, Calif., builds tiny scenes with tiny people inside discarded light bulbs. He has filled several hundred bulbs of all sizes this way.

Balsa Bridge. Nearly 700 bits of wood were glued together for girders of this miniature of New York City's Bronx-Whitestone Bridge. Students at New York University made it.



Motorized Mower. A $\frac{1}{8}$ -hp. electric motor does the work when Frank Young of Lakewood, N. Y., mows his lawn. The motor is mounted on the handle of his old hand mower, geared to the wheels by a bicycle chain and sprocket plus belts and pulleys.

IDEAS FROM WELDWOOD



The Weldwood Question Box

Q. I want to finish off a playroom. How do I go about putting wood paneling over a concrete-block wall?

A. First make sure walls are dry and no moisture problem exists. Then put up your furring strips (1" x 2" pine)—horizontal ones every 16"—vertical ones every 4'. Vertical strips should be placed so the joints of the paneling will fall on them. Use wooden shims behind furring where needed to make all the furring strips even. To attach furring strips to concrete block, use anchor bolts or cut nails. After furring is in place, nail the paneling right to it—or better still, use Weldwood Contact Cement and avoid nail holes in the wood face. Leave about 1/8" space between bottom of panels and floor, for air circulation.

Q. Planning on painting some fir plywood. How can I keep grain from showing through?

A. That's simple. Prime the plywood with a coat of white Firzite. Firzite is specially designed to seal wood pores and help tame unsightly grain. Sand lightly, and apply finish

THIS MONTH'S PROJECT — LAWN CHAISE

Here's the way to soak up the sun in style! This form-fitting chaise is extra comfortable and so easy to build. (See coupon for Easi-Bild Pattern*.) It's a handsome addition to your lawn furniture . . . and even comes apart for easy storage or for carting to the beach. You'll find it's a good idea to build two of them . . . because they'll be in demand all summer long.

And you'll find it's an extra good idea to make your chaise with either Weldwood exterior plywood or with amazing new Weldwood Duraply®. New

Duraply is easy to work, gives you clean edges. And Duraply has a special tough facing that will save you paint. Needs no priming coat! Two coats on Duraply's super-smooth surface actually give the same coverage as 3 coats on ordinary wood. And the paint will stay new-looking longer. The overlay face is completely weatherproof, too. You'll have no fear of the rain damaging your chaise.

*T. M. Reg. Easi-Bild Pattern Co.

This Month's Hints

1. Putting an addition on the house? You can save time and trouble with Weldwood fir plywood for sheathing, sub-flooring, and roof-decking. Plywood makes a very strong and rigid structure . . . goes up fast . . . holds nails well . . .

and there's almost no waste. **2. Screws put into the edge** of a piece of plywood should be just long enough to take a 3/4" bite into the wood. Shorter screws won't hold securely enough . . . longer screws won't add much, if any, strength to the joint.

coat. Use white Firzite as an under-coat for paint or enamel. For varnish or stain finishes use clear Firzite.®

HAVE A QUESTION?

Send it to "The Weldwood Question Box," 55 West 44th St., N. Y. 36, N. Y.

\$10 for your ideas

for "This Month's Hints", if accepted for publication. (Hints must apply to some Weldwood product.) Send them to Weldwood Hint Editor, 55 West 44th St., New York 36, N. Y.



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LATE NEWS...

The atomic-powered airplane will soon be abuilding. The Air Force has ordered the plane itself from Convair, and has allotted \$11,400,000 to start building a runway—three miles long—for it near Idaho Falls, Idaho. An operating reactor has already flown experimentally in a B-36. It does not power the plane, but is used to study problems of shielding crew and equipment against radiation.

Fish navigate by the sun, just as bees and birds do, reports Arthur D. Hasler of the University of Wisconsin. He found that minnows in a tank quickly learned to use an artificial sun—a light bulb—to locate a food dish. The fish were also good at remembering landmarks: scratches on the tank wall, water pipes, etc. Hasler previously showed that salmon use their keen sense of smell to find their spawning grounds, identifying the home stream by its faint but characteristic odor.

SUBURBANITES DRIVE MORE

Detroit study shows that the farther outside the city people live, the more cars they have and the more they use them



Workshop inventors still give the high-powered organized laboratories a run for their money, a study by Prof. Jacob Schmookler of Michigan State University indicates. Dr. Schmookler says that a fourth of all patented inventions are the work of independent individuals. About a third of all inventors have no training in science or engineering; nearly half do not have college degrees, the study found.

Frozen batteries are being stocked by some garages. The batteries are stored in regular kitchen freezers until sold. This maintains their charge much longer, according to Bowers Battery & Spark Plug Co., Reading, Pa.

Radar watches your speed in every part of the Union. There are now 1,398 sets in use, the AAA says. Ohio leads all other states with 174.

An artificial star that lasted about 10 minutes was created by Air Force scientists. They shot nitric oxide gas 60 miles into the sky with a rocket. This gas caused free oxygen atoms to combine into oxygen molecules and emit light. At first the flash was twice as bright as Venus, then it grew until it appeared four times as big as the moon. The Air Force says: "The experiments may lead to means of extracting this energy for the propulsion of rocket ships."

Pill for diabetes? A chemical related to the sulfa drugs reduces blood sugar and may relieve *some* diabetics of the need for daily shots of insulin. Called Orinase, it was discovered in Germany and is being developed by Upjohn Co., but is not yet on sale.

Over-the-pole air travel is planned by two U.S. airlines, Pan American and TWA. The North Pole route would save as much as 15 hours and 1,074 miles on flights from the West Coast to London. Polar flights are already operated by Scandinavian Airlines.

Good book. Dr. John R. Pierce, director of communications research for Bell Labs, is also J. J. Coupling, top-ranking author of science fiction. Pierce/Coupling's newest work, *Electrons, Waves and Messages* (\$5, Hanover House, Garden City, N.Y.), is not fiction, but a sound introduction to the wonders of electronics.



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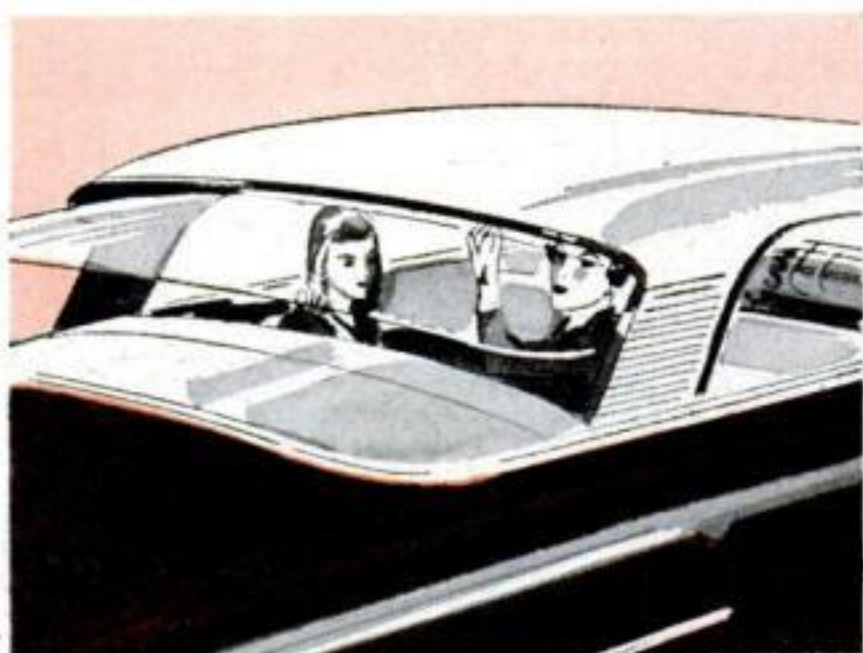
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I'd like to see them make...



A SHOWER CURTAIN that could be pulled down or raised like a window shade. Cleaning the tub would be easier with no curtain dangling in the way.—*Troy Claffin, Pensacola, Fla.*



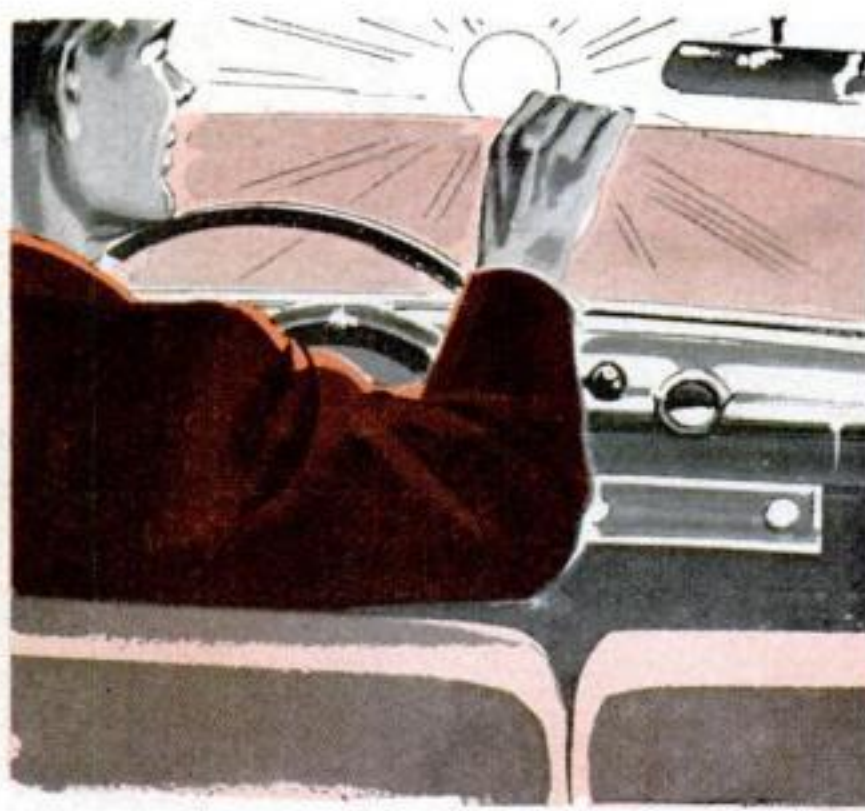
REAR WINDOWS ON STANDARD CARS that could be pushed outward like those on station wagons and some taxis. You'd get a lot better ventilation in hot weather.—*C. W. Manning, Ovid, N. Y.*



SPADE HANDLES scaled in feet and inches (counting from tip of blade) so you could tell how deep you've gone when you're digging holes.—*Edward Breslin, Central Islip, N. Y.*



A LUMINOUS SHUTTLECOCK for playing badminton after dark. This would be much less expensive than installing lights around the court.—*Ronnie Artz, Middletown, Pa.*



A DASHBOARD-MOUNTED VISOR to cut glare from the car's hood. In the late afternoon, this reflection can be as troublesome as direct sun rays.—*Richard W. Enz, Prescott, Ariz.*



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What's all this about

Britain's Mystery Car?

**Harry Ferguson drops a few clues about his new car.
Probable features: new braking, steering, suspension.**

By David Scott DRAWINGS BY STEWART ROUSE

LONDON
WHEN Harry Ferguson, the highly respected British inventor, let it be known last year that he was working on a revolutionary new car, speculation about it built up to a scale comparable to that aroused by Princess Margaret's recent romance. Since Ferguson is a successful and highly original designer, curiosity spilled out swiftly.

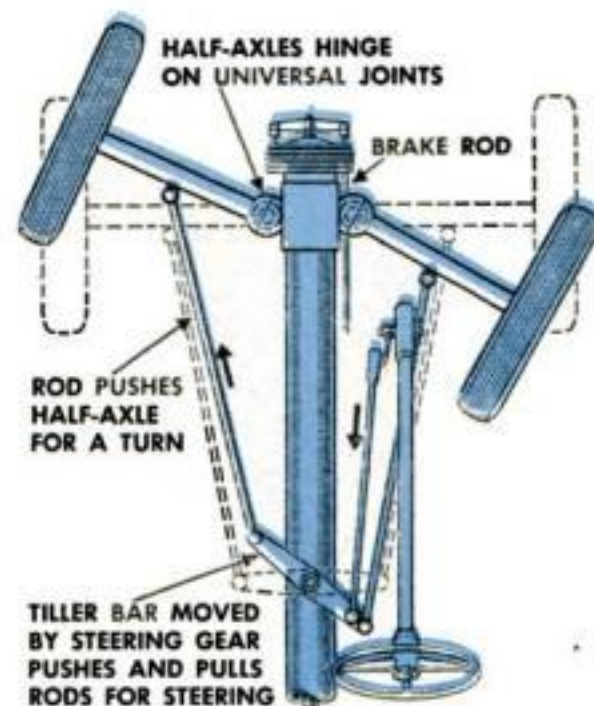
Ingenious mechanics. While at this writing the answers are not all in, two facts have grown increasingly clear. One is that the speculation has been deliberately stimulated, as part of a calculated plan. The other is that some intriguing and ingenious mechanical designs are in the offing.

Harry Ferguson is a crusader whose first passion was to bring cheap food to the masses with less drudgery for farmers. At the start of World War I, this Irishman, then 30, developed the rudiments of the "Ferguson system" for hitching implements to a tractor. His idea was to put the plow's weight on the rear wheels, not just dragging behind.

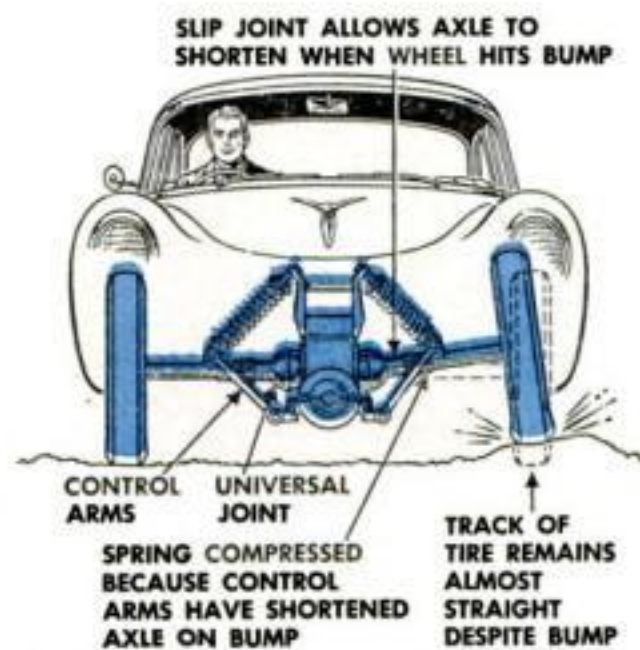
This greatly improved wheel grip, while permitting a much lighter and more economical tractor. By 1935 he had perfected the system with hydraulic linkage, automatic depth control and other features. Now the system helps farmers everywhere.

Showmanship. But Ferguson is also a shrewd publicist. Once, when pressing his "more food" campaign, he drove a tractor around the ballroom of Claridge's, London's ritziest hotel. Today the build-up for his new vehicle project is thorough and well organized.

He believes that propaganda plays a fundamental role in any operation, and accordingly he works with a high-powered public-relations agency. Pegged to the magic name of Ferguson, stories are

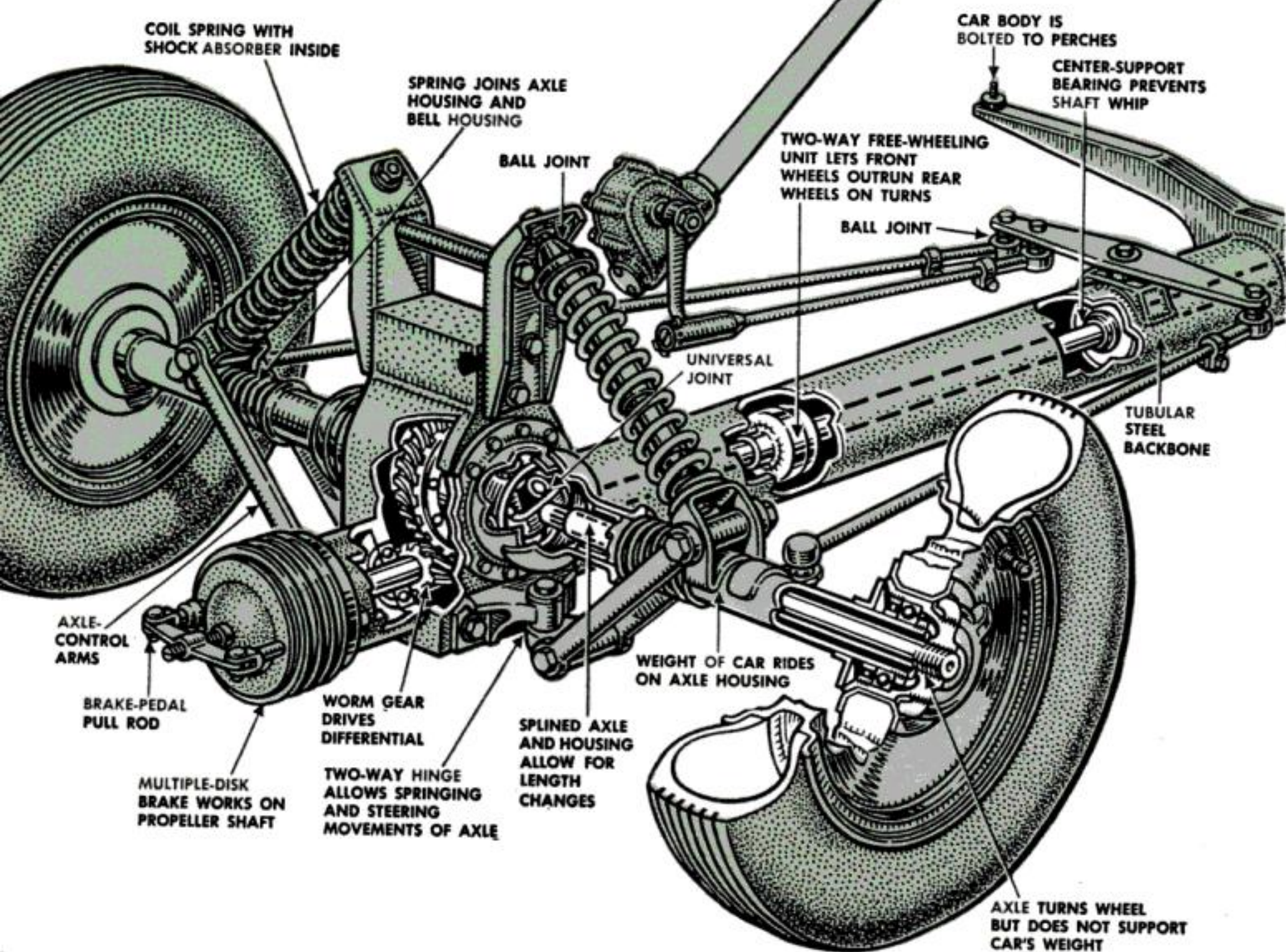


COASTER-WAGON STYLE, the new car may steer by pivoting the front half-axes about the "backbone."



SWINGING UPWARD, all wheels are independently sprung. The geometry minimizes changes in track.

LOW, LIGHT AND CATFOOTED, the innards of the new car might be like this conception by artist Stewart Rouse. A dominant idea underlying the design is to retain maximum wheel adhesion: No wheel can be locked or spun unless the other three are, too. Note that there is a minimum of structure in the load-carrying area, and that the center of gravity is kept down low.



carefully "leaked" to the press about a revolutionary new type of car. They get a big play.

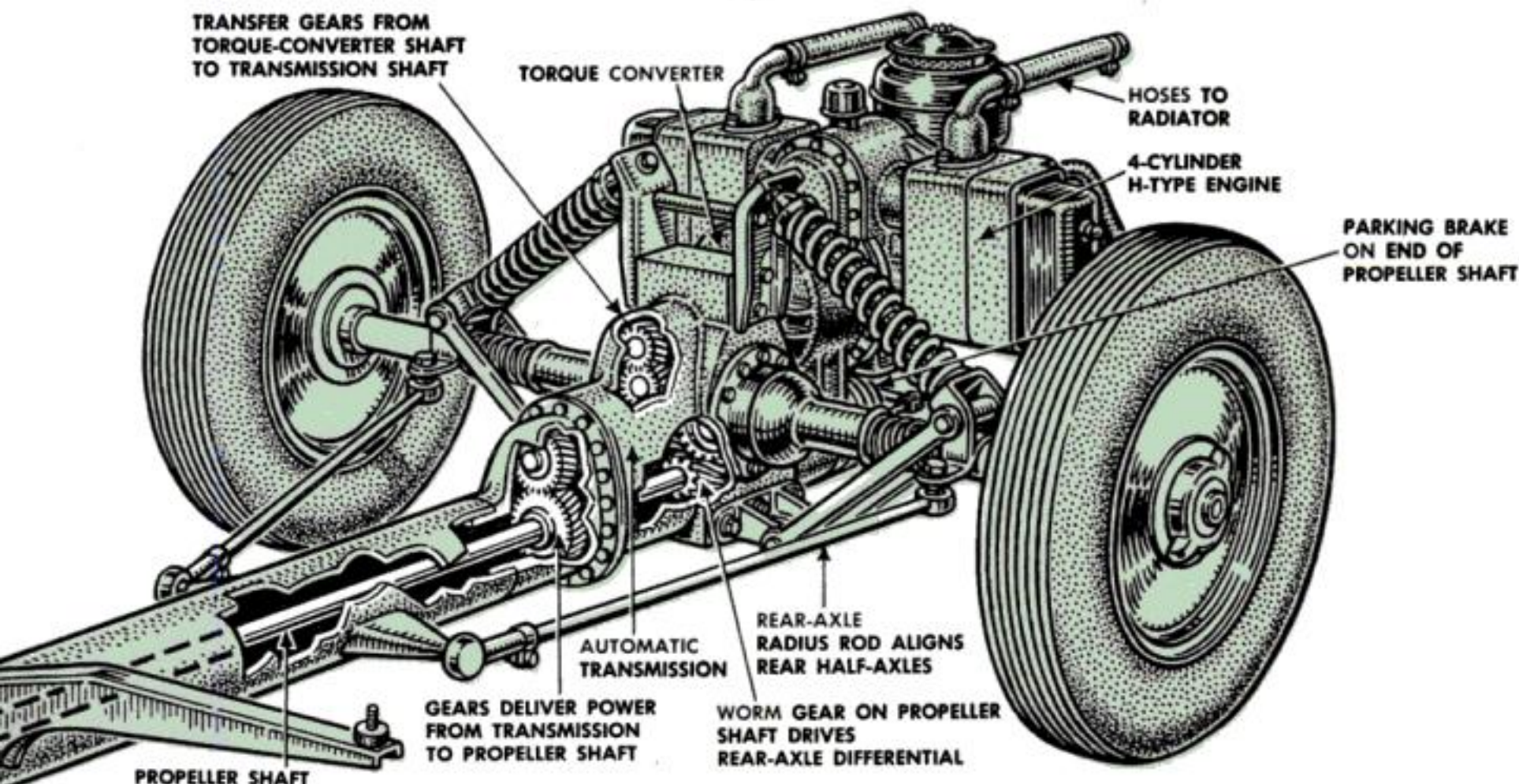
Hiding in hedges. For all the publicity, hard facts are difficult to pin down. Harry Ferguson Research Ltd. does its experimental work at an abandoned airfield a hundred miles from London. Newsmen have hidden in the surrounding hedges for days at a time, like patient hunters sweating out a flight of ducks. Their reward has been little more than sneaked views of lumpy machinery shrouded under dust covers.

One widely circulated "inside story"

described the car as having a hydraulic turbine on each of the four wheels, supplied with oil under pressure from a common pump. This was supposed to assure smooth getaway and exceptional traction, since torque was fed evenly but independently to all wheels. Balanced, nonskid braking was to be effected by reversing the flow to the turbines, opposing rotation.

Ferguson laughs at such reports, describing them as "highly inaccurate." Yet he doesn't mind, for they are more grist for his publicity mill.

Hitting close to truth. But he gets



concerned when published accounts of his car hit too close to truth. The story he is understood to have been worried most about was carried in a reputable British magazine, *The Economist*. This is the hottest clue yet, for it outlines the rudiments of a chassis that closely resembles some fascinating designs patented by Harry Ferguson Research Ltd. in 1951, and recently revealed.

The account that allegedly annoyed Ferguson because of its accuracy said that "the four-wheel drive is not based upon individual drives or turbines for each wheel, nor is there any question of braking by some reversal of hydraulic force. Braking is by inboard disk brakes fitted to a mechanical transmission, automatically distributing the braking force to each wheel through the differentials.

"This inboard system, dispensing with brake drums and simplifying the anchorage of the wheels to the chassis, lightens the whole chassis and in particular the unsprung weight. The four-wheel independent springing uses vertical coil springs. Any engine one likes to use can go more or less where one likes . . ."

Patent shows way. The specifications included in the original Ferguson patent follow this description in detail. While the changes undoubtedly made in the past five years are a carefully guarded secret, it's a fairly safe bet that the basic concepts still hold.

The chassis consists of a tubular backbone housing the propeller shaft. Favored position for the engine and transmission seems to be at the rear. Wheels are carried independently on swinging half-axles, and joined to the fore and aft differentials by universal joints.

The steering is thoroughly unorthodox, unless you think of a horse-drawn cart (with two half-axles). Front axles pivot laterally through a wide arc on these same inboard joints. A brake acting on all wheels is fitted to the propeller shaft. Worm-drive differentials with an under-slung shaft allow the brake to be carried on a forward extension of the backbone.

Engine astern. The rear-mounted engine is believed likely to be an opposed four-cylinder one, its compact size limiting rear overhang. An unusual constant-mesh gearbox was originally described. But since Piero Salerni, inventor of the Salerni automatic transmission, has since linked up with Ferguson, it is now believed that a hydraulic torque converter and automatic gearbox may be envisaged.

Dividing the propeller shaft between the front and rear axles is a double-acting free-wheel device. It enables the front wheels to overrun the rear ones during a turn, when they have farther to travel.

Little spin and lock. In addition, the rear wheels cannot spin unless the front ones do also. And the device keeps all

wheels under power when reversing. This reflects Ferguson's determination to maintain good road adhesion under all conditions.

Another instance is the single brake, acting on all four wheels. This should reduce the risk of skidding, for the retarding force is inherently equal all around, and no wheels can lock as long as one of them keeps on turning.

The brake itself is made up of a stack of intermeshed disks, alternately fixed and rotating, which are mechanically compressed to give braking. Since it operates on the drive shaft before the worm reduction gear, it handles a much smaller torque than wheel brakes would. Placed centrally at the front of the vehicle, it is not only easily cooled by onrushing air but is also readily accessible for inspection and for servicing.

Less bounce. The design reduces unsprung weight to no more than that of the wheels themselves and about half their axle assemblies. Thus traction is still further improved, for the lesser moving mass means less shock and less wheel bounce on a bump. Smaller springs and shock absorbers are needed to handle the reduced energy, and they will give a smoother ride.

Front and rear suspension systems are basically identical. Inclined coil springs enclosing the shocks cushion the vertical movement of the half-axes.

Axles change length. To minimize variations in track width as the wheels swing up and down—another cause for poor road adhesion and of rubber-destroying tire scrub—the axle changes in length to compensate somewhat for upward wheel travel.

A splined coupling is fitted to each half-axle. The hollow outer housing is made in two pieces joined by a heavy coil spring. Its outer part is retained by a radius arm linked to the base of the differential. Its geometry causes the wheel to slide in slightly with upward movement and out with downward. Thus the arc described by the wheel during deflection is substantially flattened.

For steering, the front-suspension assembly is arranged to permit fore and aft swing of the axles. Radius arms and spring mounts are pivoted and ball-jointed to allow this. The actual steering movement comes from struts linked to a tiller bar, controlled by a conventional steering gear.

Likely improvements. These are some of the principles that will probably find a place in the future Ferguson design. Some improvements and modifications can certainly be expected. For example, hydraulics

may become more prominent, perhaps in the suspension and in the brake.

For Harry Ferguson, now 72, these concepts are the culmination of a long career that started in 1900 when he repaired racing cars in his garage. He thinks in broad terms—of basic components that may be used in a jeep-like military vehicle, or a cross-country car, or an ultra-safe family sedan.

He is now negotiating with several British and American companies to find a suitable manufacturer. Further details will not be disclosed until a deal is signed, which may be this fall. The talks are taking time, for Ferguson wants to see his ideas mass-produced on an immense scale—so that his new form of transport can benefit millions. **END**



HARRY FERGUSON, a highly successful inventor, has built a reputation on stubborn originality. His new car may be like nothing ever seen before.



Spinning Dial Opens the Door

You have to know the right numbers to get through this door. It's the entrance to the office of the NCO Club at Yuma AFB, Ariz., fitted with a phone-dial combination lock invented by S/Sgt. Raul DeHoyos. Dial correctly and you're in.



Small-Screen TV Comes Back

You can tote this 13-pound TV set out onto the patio or off on vacation. The nine-inch picture tube is packed into a case 8½ by 9½ by 13¾ inches. A rabbit-ear antenna folds out of the way when the little GE set is being carried.

Atomic Worker Wired for Sound

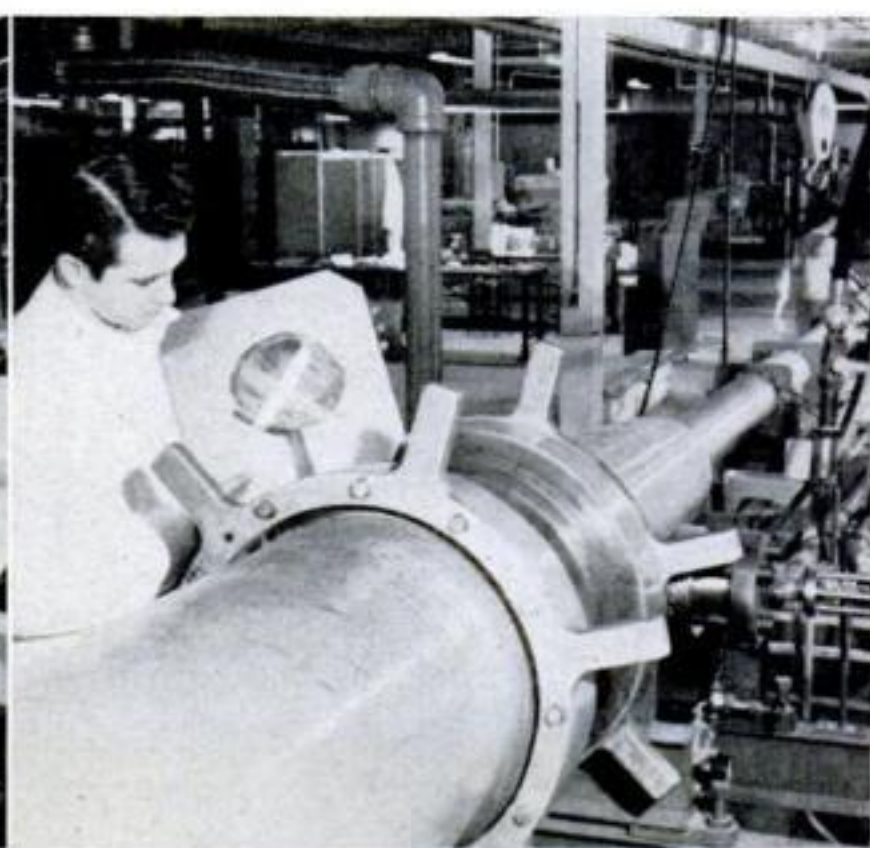
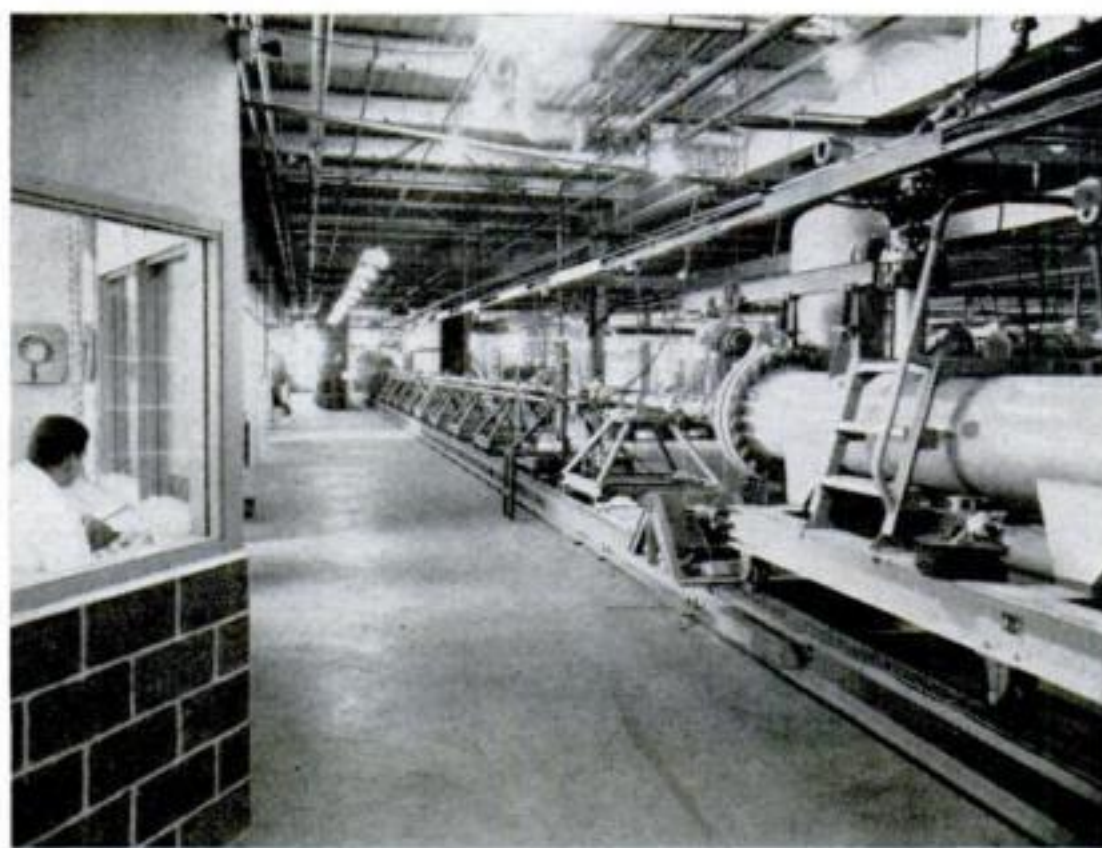
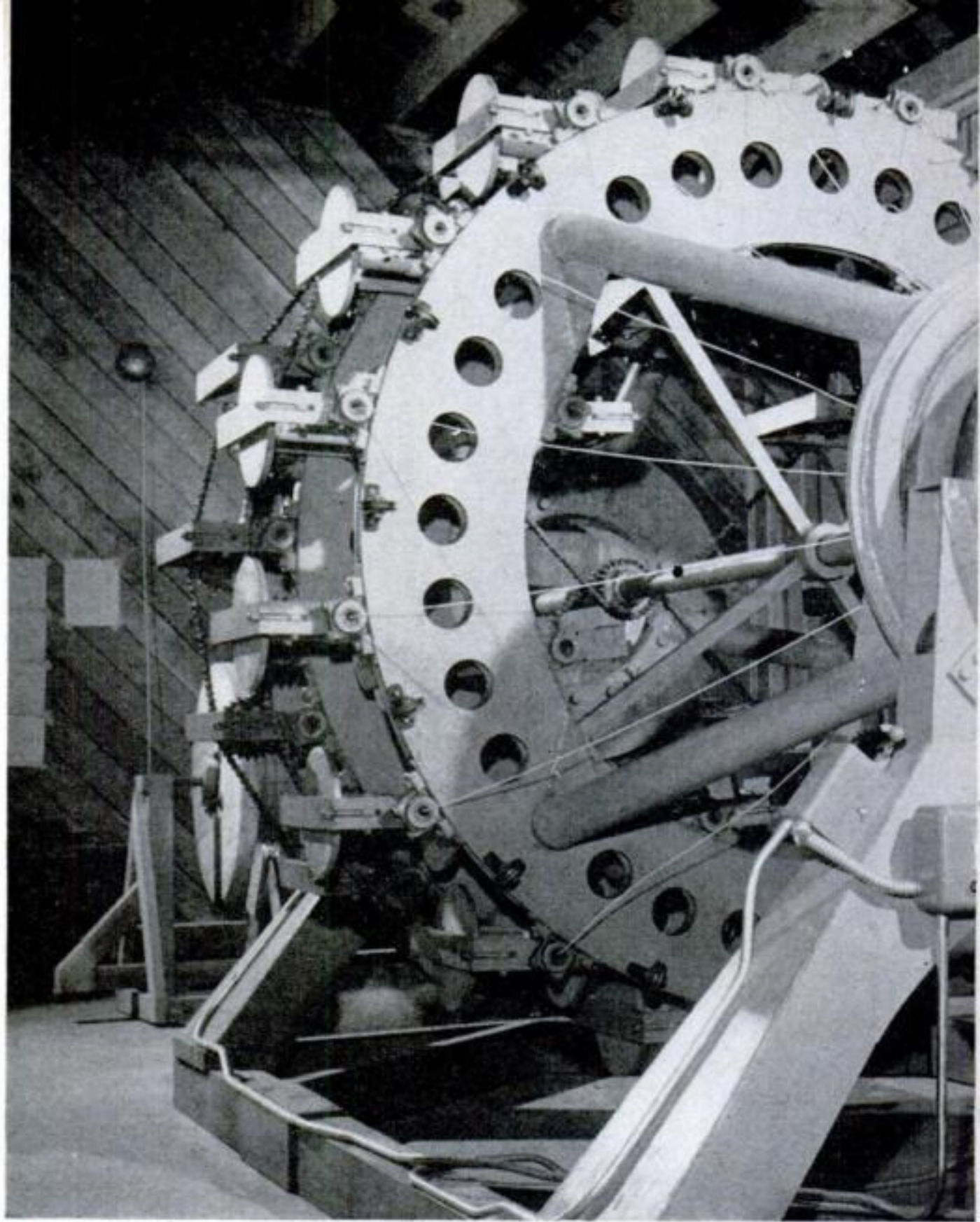
THE masked workman above is wearing head antennas and a throat mike to report "hot" areas in a plutonium plant. Readings taken on the round detector are radioed to a distant tape recorder.



Cabler Weaves 217 Wires Into One Line

THIS planetary cabler was developed to bundle into a single cable the jungle of conducting wires and hydraulic and pneumatic lines required in launching and guiding missiles. It combines up to 217 lines in a cable ranging from a fraction of an inch to three inches in diameter, and lays up to 48 conductors at a time in a concentric pattern from as many whirling bobbins.

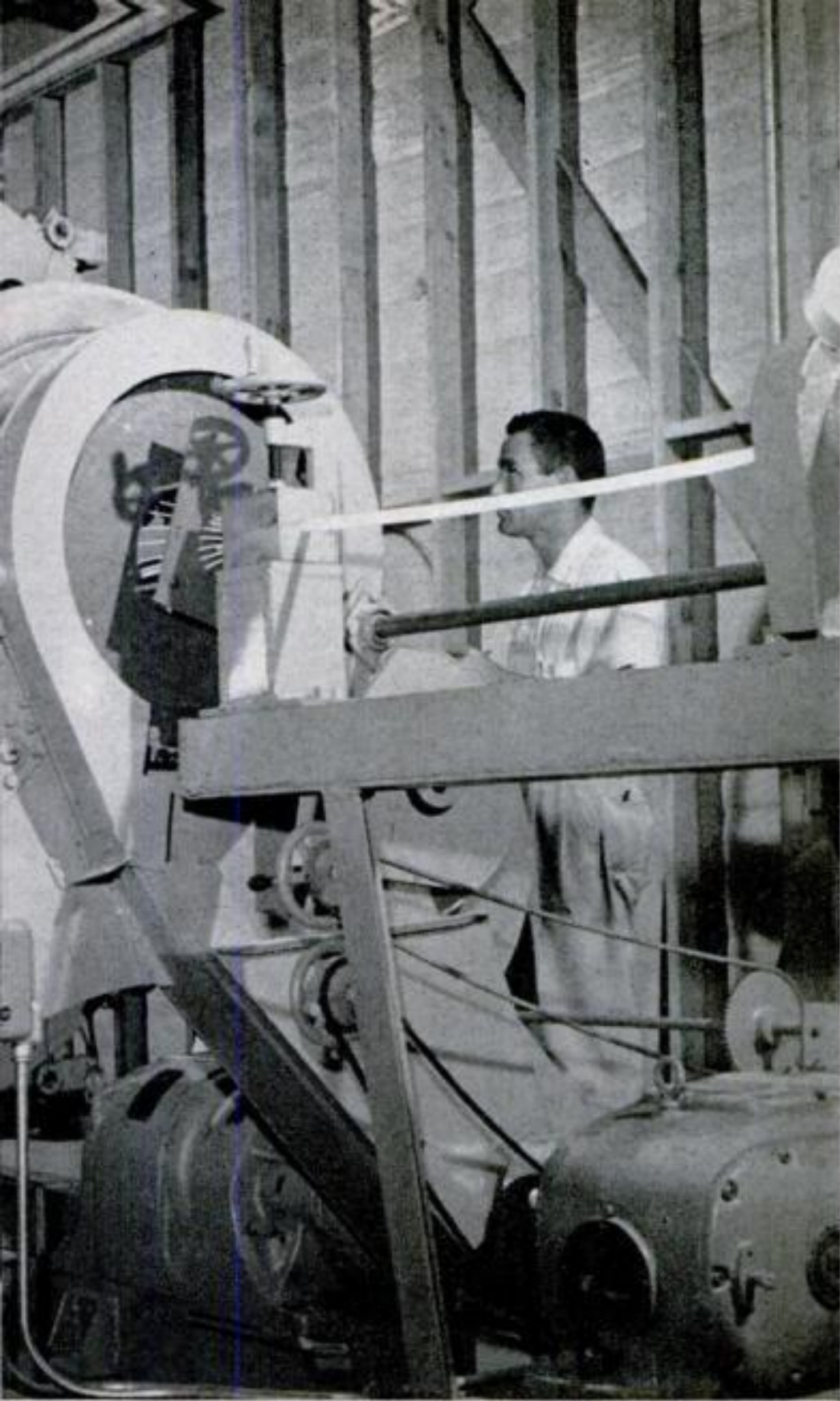
The machine, built by Douglas Roesch, Inc., of Los Angeles, lays each conductor in position with the proper tension and freedom from twist. The "pitch" of the strands can be varied for more or less flexibility.



Cannon-like Wind Tunnel Creates 18,000-M.P.H. Shock Waves

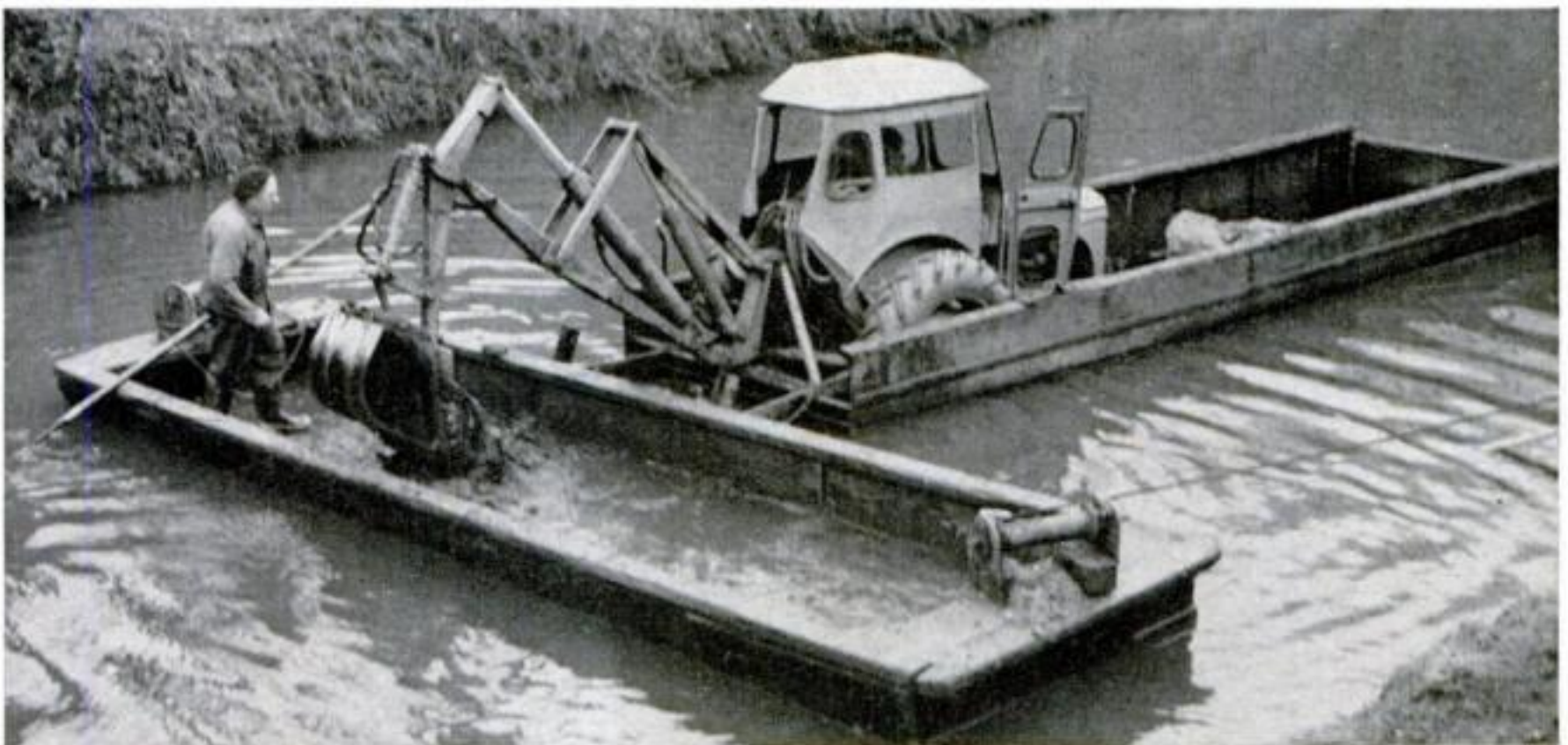
WHEN this 100-foot gun is fired from its control booth (left), a steel diaphragm at the far end (shown being loaded at right) is burst by gas under

extreme pressure and sets up a shock wave speeding at 18,000 m.p.h. Avco Mfg. Corp., Everett, Mass., uses it in missile research for the Air Force.



Window Shopper Can Now Buy

LITERAL meaning has been put into the term "window shopping" by an enterprising book-store manager on London's Strand. The customer here makes a purchase right through the show window which has a detachable glass panel.



This Tractor Rides Aboard a Barge to Dredge British Canals

A TRACTOR floated in a shallow barge is being used by British Waterways to dredge its canals. A rear-mounted hydraulic digger on the Ferguson shown

here scrapes the bottom and dumps its load into a second barge pulled into position from towpaths. The combination can pass under low and narrow bridges.



The Man

ANTHONY W. LeVIER, director of flying operations, Lockheed Aircraft Corp., was the first man to fly the XF-104. One of the best-known pilots in the U.S., he learned to fly at 15. He has won several celebrated air races, ferried Hudson bombers for the RAF, demonstrated the P-38 here and in England. He was the first man to fly the P-80, the Saturn, the F-90, F-94, Constellation, as well as the new XF-104. He is also the author of an autobiography, called *Pilot*. Tony LeVier is shown at left beside another jet in the ordinary flying suit he prefers to a pressure suit except when called to "wring out" a new plane.

How it feels to fly the World's

Noted test pilot takes you for a ride in the F-104A at more than twice the speed of sound.

By Tony LeVier

AS TOLD TO WESLEY S. GRISWOLD

A LOT of people have already tried to describe the new supersonic F-104A Starfighter. Some call it "a missile with a man in it." Others call it "a flying pencil." Gen. Nathan F. Twining, Air Force chief of staff, says that it is "the fastest and highest-flying fighter anywhere in the sky." Gen. Otto P. Weyland, head of the Tactical Air Command, declares, "No country in the world can match it at this time."

I was the first pilot to fly its prototype,

the XF-104, and it's hard for me to find the words to tell you how I feel about this plane. It has the finest touch of any fighter in modern times. I've gone through the sound barrier in it without knowing it—with my hands behind my head, in fact! I've gone supersonic in it *in a climb*. It's so maneuverable that it seems as if you merely had to *think* of turning left or right to have this baby start doing it, and gracefully.

It's capable of darn near flying out of the atmosphere or accelerating till things begin to melt. Yet it's incredibly stable.

A fighter pilot wants his plane to respond briskly to everything he does, without superfluous motions. He doesn't want it to jazz all over the sky in a turn or bob its nose up and down when he

The Plane

A TOP SPEED of 1,500 miles per hour—faster than the sun crosses the sky—is estimated for the missile-like F-104A. Experts reckon that its service ceiling is somewhere between 60,000 and 75,000 feet. The main fuel supply is between the pilot and the engine, which is said to develop a 15,000-lb. thrust. Equipped with additional, underwing pylon tanks, the plane is estimated to have a 2,200-mile range. It can climb like a rocket, reaching the stratosphere in a matter of seconds. For combat it is said to be armed with a very fast-firing cannon, and can carry missiles or an atomic bomb depending on the mission involved.



Fastest Fighter

wants to fly straight. When he's through maneuvering, he wants to level off and stay level. The F-104A behaves just the way he dreams the perfect fighter should behave.

But—climb into the cockpit and try it yourself.

First, you put on a pressure suit. You've seen them. They make you look like Superman and feel as if your whole body were in a tight glove. You strap on your seat pack, which has a survival kit stowed away in its cushion. You put on the pressure helmet, which has an oxygen source in it.

The cockpit canopy is hinged at the left side. The right side is raised for you, like half the hood of an old-time car. A crewman hooks a light ladder onto the

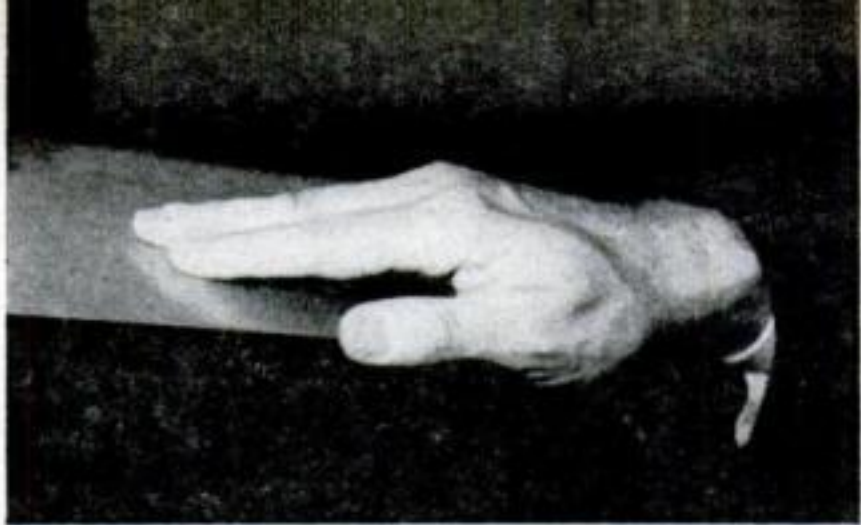
rim of the cockpit and you hoist yourself up and into your seat. You fasten your seat belt, shoulder harness and leg straps.

A portable turbine starter is wheeled up to the right side of the plane. It takes so much power to start the J-79 engine that no electric starter made is big enough for the job.

When the starter is twirling the blades of the main turbine at 10 to 15 percent of maximum engine r.p.m., you move the throttle from "Cutoff" to "Idle." The engine starts with a tingling roar that rises quickly to a scream.

You pull down the cockpit cover and latch it, and start running through the check list to make sure you're okay to take off.

You may get a touch of claustro-



NEARLY AS SHARP AS A KNIFE, the leading edge of the F-104A's wing, thinnest of all fighter wings, is only sixteen-thousandths of an inch thick. It is padded to protect ground crews.

phobia at first. But you soon get used to the fact that the cockpit canopy is only a hair above your helmet when you straighten up, and you can't turn your head around as far as usual. Admittedly the seat is not like your favorite living-room chair, but you can raise or lower it four inches and adjust the pedals to the length of your legs.

The F-104A has the simplest cockpit and smallest instrument panel of any modern fighter. The controls are all easy to reach.

When you're ready, you signal the crew, taxi out to the runway and line up. You move the throttle forward to "Afterburner." The thrust is so tremendous that it is all you can do to keep the wheels from skidding.

You release the brakes and start charging down the runway.

How can you see where you're going? Well, the F-104A's cockpit is so far forward and its needle nose slopes so sharply that your visibility is as good as it would be if you rode on the hood of your automobile instead of behind the steering wheel.

I've taken off in jets so many times that if you were to remove every instrument from the cockpit, I could take off okay just by feel. But you'd better take

off by the air-speed indicator. Get off the ground at 200 m.p.h. By then you will have covered approximately a mile of the runway.

You hear the engine whine as you become airborne, but already its sound seems pretty far behind. You're more conscious of the rush of air into your cooled cockpit from a tiny turbine that maintains the proper pressure for you at any altitude. You sense a tenseness in the plane, rather than hear a loud noise, as its exhaust bellows out the tailpipe with increasing fury.

Suppose you decide to go into a steep climb. In seconds, the needle of the Mach indicator has moved to "1." There is a sudden quietness. You feel no flutter, no tendency of the nose to dip, no urge of the wing to drop to one side or the other. But your altimeter, Mach indicator, air-speed indicator and rate-of-climb indicator all go crazy for a moment, thrown out of kilter by the passage of the bow wave over the Pitot-static tube, in that long boom that projects from the nose. Then they spin to new, true readings.

You're through the sound barrier, and still accelerating. You've left all sound far behind, except for the whish of your cockpit pressurizer.

The F-104A performs at its best at ultrasonic speeds, and when it reaches the stratosphere it will climb as fast as it will go in level flight.

All you can see is the deep blue sky. You have to look down to find the horizon. You feel as if you were lying on your back with your feet in the air, as though you were doing a setting-up exercise. Your feet have a natural tendency to fall back toward your face, but you



THOSE STUBBY WINGS are only 7½ feet long, and straight except for a slight downward slant. The plane doesn't need a "Coke bottle" waist because it slides so easily through sonic wall.



UNLIKE MOST FIGHTER PLANES, the F-104A retracts its landing gear into the fuselage. The plane is 54 feet, nine inches long; weighs 15,-

000 pounds. Intake ports are covered here for security reasons. The man in the pressure suit is "Fish" Salmon, Lockheed's chief test pilot.

don't have to exert much conscious effort to keep them on the pedals.

Had enough? Then ease her over to level flight. The earth now looks just the same as it always does from a plane, but all at once you are aware that places on the map that are long miles apart—places separated by winding roads that you have often driven over—are flashing past in seconds. You get excited just glancing at your instrument readings.

Suppose, at this exhilarating moment, something starts to malfunction. A master warning light flashes on in the center of the instrument panel. But you look to the right, at a little printed panel hardly any bigger than a playing card. It has a series of listings on it, and the one that is illuminated tells you where the trouble is. I'm proud of that system, because I helped develop it.

Let's say it's a temporary malfunction, one that miraculously straightens itself out. I don't want you to have to try out the downward ejection seat on your first flight.

But you're ready to come down anyway? Well, you start descending and decelerating in a great circle whose radius is many miles across. But take it easy.

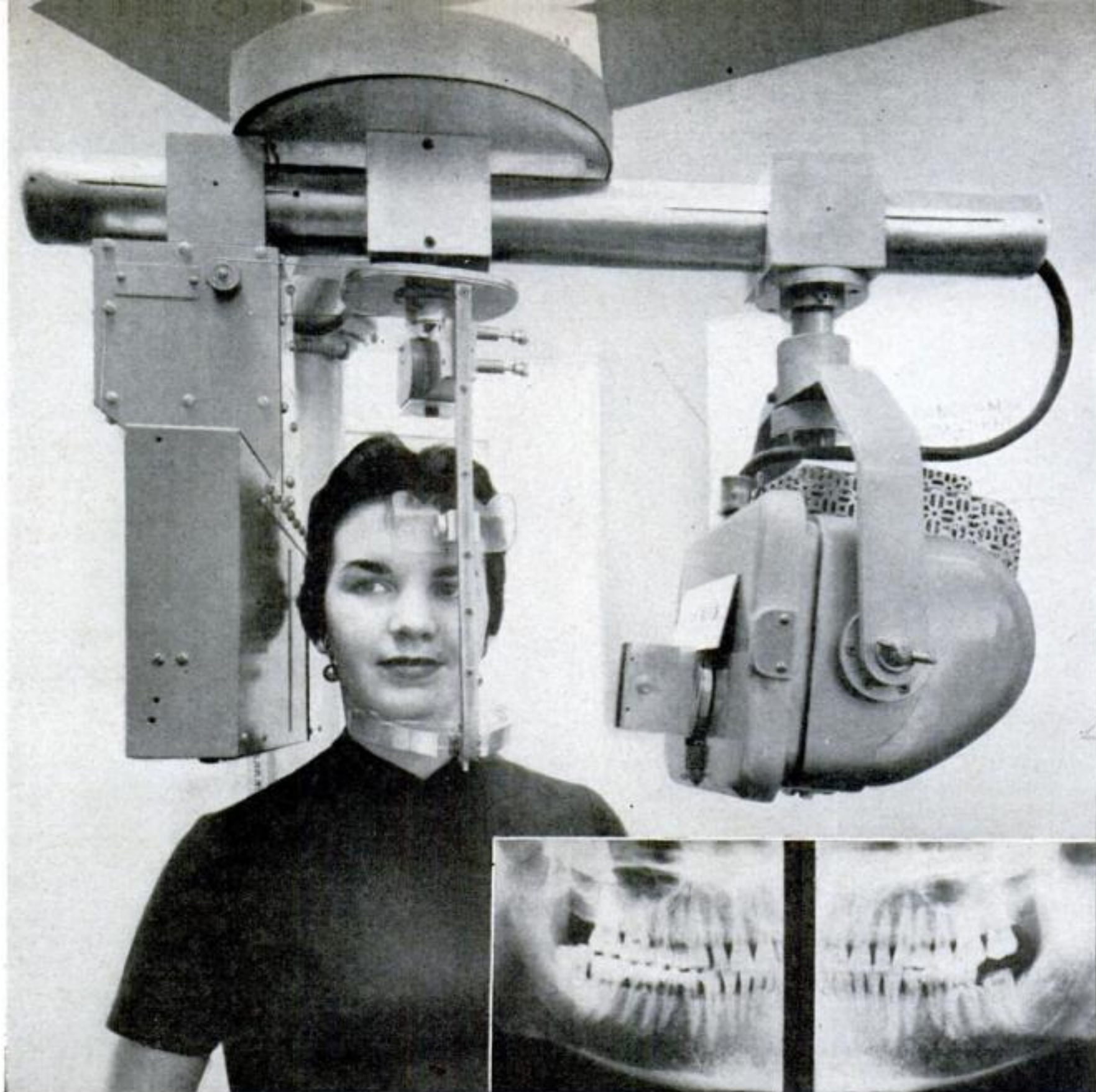
Remember that you can close on the ground at the rate of 100,000 feet a minute in this plane!

You re-enter the traffic pattern of the field at about 350 knots—that's around 400 m.p.h. And continue to ease up on the throttle as you swing around to line up with the runway the tower has told you to use. You nose her down at about the same angle at which you took off—14 or 15 degrees—and touch the edge of the strip at around 175 m.p.h.

That's twice as fast as an airliner lands, but fighter pilots are used to such speeds. Your F-104A is so small and so stable that crosswinds or turbulent air give it very little trouble. Besides, you know that you have about twice as much runway as the average commercial field provides.

Once your wheels are on the ground, you lower the nose, apply your brakes and reach for a T handle on the dash. Pulling it releases the tail chute. It'll cut your landing roll about in half.

You feel a snubbing effect but no jerk. The chute billows out rather than popping open, and you slow down more smoothly and quietly than an airliner does when it reverses props. **END**



Panoramic X-Ray Machine Gets Every Tooth with One Shot

A PANORAMIC camera for X-raying all of a person's teeth in one exposure has been developed by the Air Force. A film holder (left) and an X-ray source, on

opposite ends of an arm, move in an arc around the head. The film travels in front of the patient, and is exposed when X-rays pass through the back of the head.



American Motors Shows Off Newest of Its High-Fendered Family

THE pint-sized Nash Metropolitan at left, built in England, has an overall length of 149½ inches on an 85-inch wheelbase. The output of its four-cyl-

inder engine has been upped from 40 to 52 hp. The Hollywood hardtop (right) is a Hudson Hornet Special. It packs a 190-hp. V-8 engine (PSM, May, p. 151).

12 New Ways to Camp in Comfort



Vacationing under canvas has long been cheap and attractive—and now it's even growing luxurious. Many new gadgets are adding the comforts of home.

By Frank Rowsome Jr.

THE Indian maharajah lolling atop his princely elephant on a jungle safari has darn few creature comforts that are not available to Joe Doaks on a U.S. camping trip in 1956.

In some ways Joe has the best of it. Where Sir Bangalore has to spend his rupees on cargo and passenger pachyderms plus a few hundred beaters, all Joe has to do is sling his camping gear in the back of the station wagon and head for the woods. And if Joe has some of the ingenious new equipment that has recently been developed, he's going to *feel* like the Maharajah of Doaks.



YOU can get the dangdest gadgets imaginable for comfy camping. There are paper sleeping bags,

cozy and warm, that are so cheap you simply toss them in the fire when the trip is over. There is a light, sleep-three-people tent that can be erected in a moment and that looks like an igloo built by a Japanese-lantern designer. There are clever folding cots, artfully insulated so that chilly air can't nip you from underneath. There are axes that turn into shovels,

bucksaws that fold to ruler size, shavers that mow down whiskers by clockwork.



A MAN must eat, in the woods especially. The new disposable-tank cook-stoves may be less romantic than a wood fire, but they are incomparably quicker and more controllable. A profusion of folding tables and chairs (calculated not to collapse in use) are available, as are ice chests efficient enough to keep ice until long after the drinks run out. There is even an entire collapsible kitchen that glides out the tailgate of a station wagon and is complete to a pump-fed water supply—in case you decide to toss tradition to the winds and wash the frying pan. And if a hunger for broiled meat should assail you, a new charcoal rotisserie uses dry cells and a motor to turn the spit.



FOR ponds and streams, there's a collapsible boat that a marooned pirate would have given a hundred pieces of eight to have. If you are on the goggles-and-flippers kick, a transparent plastic boat allows you to



1. Pop tent



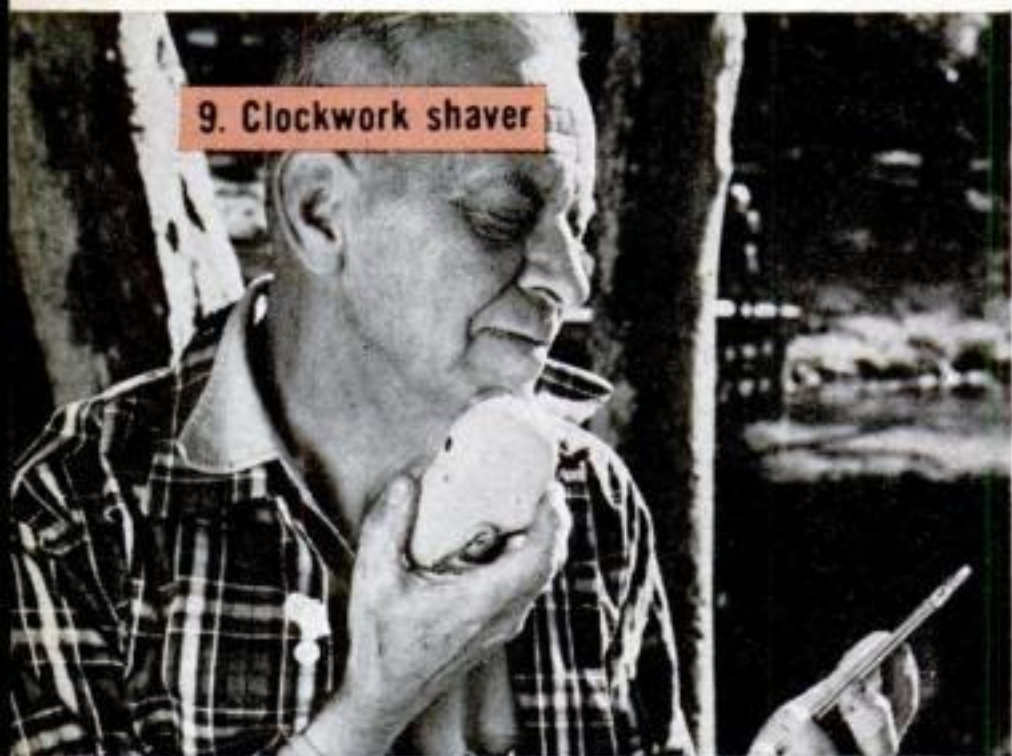
2. Auto kitchenette



5. Insulated cot



6. Transparent boat



9. Clockwork shaver



10. Paper sleeping bag

watch the fish go by, and conveys the eerie impression of rowing in a soap bubble. If the ducks, fish, or other objective of your boating are guarded by snags and shallows, an air-driven outboard will propel you smoothly past obstacles that

would sadly maltreat an ordinary motor.

For dudes and sports? It'd be wrong to surmise that all this new gear is strictly bait for rich sports. Luxurious equipment for these characters has been made for decades, of course, and no amount of

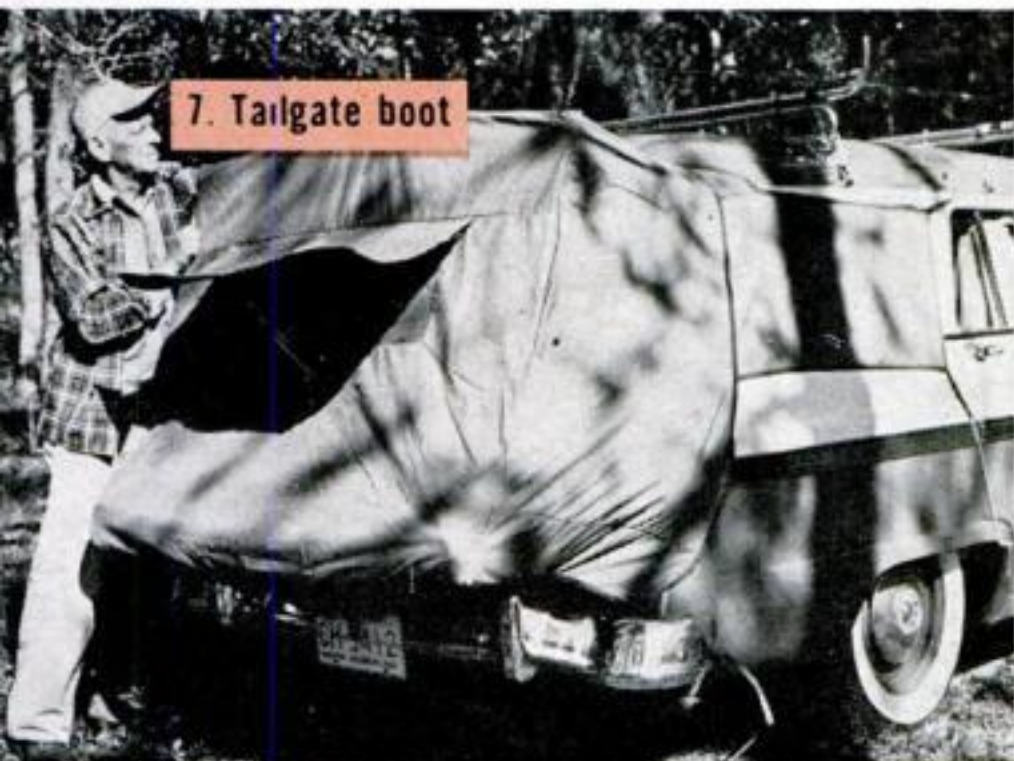
More information about the products on these pages can be obtained from: 1. Stross Mfg. Co., Box 302, Ann Arbor, Mich.; 2. Camp-N-Wagon, Box 145 E, Pasadena, Calif.; 3. Gibbons Supply Co., Box 226, Birmingham, Mich.; 4. Porta Co., Canton, Mass.; 5. Seattle Quilt Mfg. Co., 308-310 First Ave. South, Seattle 4, Wash.; 6. Goodhue Enterprises, Box 461, Leominster, Mass.;



3. Car screens



4. Folding boat



7. Tailgate boot



8. Folding tools



11. Air-prop motor



12. Station-wagon mat

invoking the shades of Boone, Crockett, and the mountain men is going to keep them from buying camp shower baths and portable duralumin commodes. But most of the rush of new equipment is aimed at different buyers: the estimated

20,000,000 ordinary folk who will camp out in this country this year.

Woods are full of them. All measurements indicate that people are taking to the woods this year in record numbers. The "camper-day" occupancy curve in

7. Gibbons Supply Co., Box 226, Birmingham, Mich.; 8. J. Chapman & Sons, 440 North Orleans St., Chicago 10; 9. Abercrombie & Fitch, Madison Ave. at 45th St., New York City; 10. Bobwing, 901 South St., Lafayette, Ind.; 11. Airboats, Inc., Box 2255, St. Louis; 12. Seattle Quilt Mfg. Co., 308-310 First Ave. South, Seattle 4, Wash.

national and state parks has been climbing steeply since the war. These places are now receiving the heaviest use in history. Last year the number of campers in government parks was double that of 1950. Makers of camping equipment are in some cases running on extra shifts; a sleeping-bag company is cranking out five times as many bags as it did just three years ago. Right now, at any popular campsite, an observant eye will detect an amazing diversity of people, including many families complete from Gramps to the smallest and dampest infant.

Where they all come from, in such remarkable numbers, is uncertain. Most theories touch on boom times, shorter working hours, longer vacations, more cars and highways, and the comparative economy of camping for family vacations. (A few family-size hotel bills may pay for a camping outfit.) There's an evident relationship or parallelism with the dizzy vogue of station wagons, which have skyrocketed from a fiddling 25,000 a year before the war to 700,000 last year.

That wagons and camping are inter-related is evidenced by the number of products designed specifically for wagon camping. Those in the photos were collected by two Ford publications as part of an ambitious testing project called Recreation Unlimited. Under this program, close to a hundred items have been



Tailgate kitchenette caters to outdoor-whetted appetites

.....

tried out in actual field use. Several of the new products were developed at the suggestion of the Ford project directors themselves. Besides the tailgate kitchenette, there are a variety of insect screens and mattresses for wagon sleeping. Another product called a "boot" is a special-purpose tent, erected around the opened tailgate, that adds considerably to interior space.

No Boones about it. With so many new hands trying camping, some woodsy innocence is inevitable. Forest rangers talk about earnest greenhorns, erecting

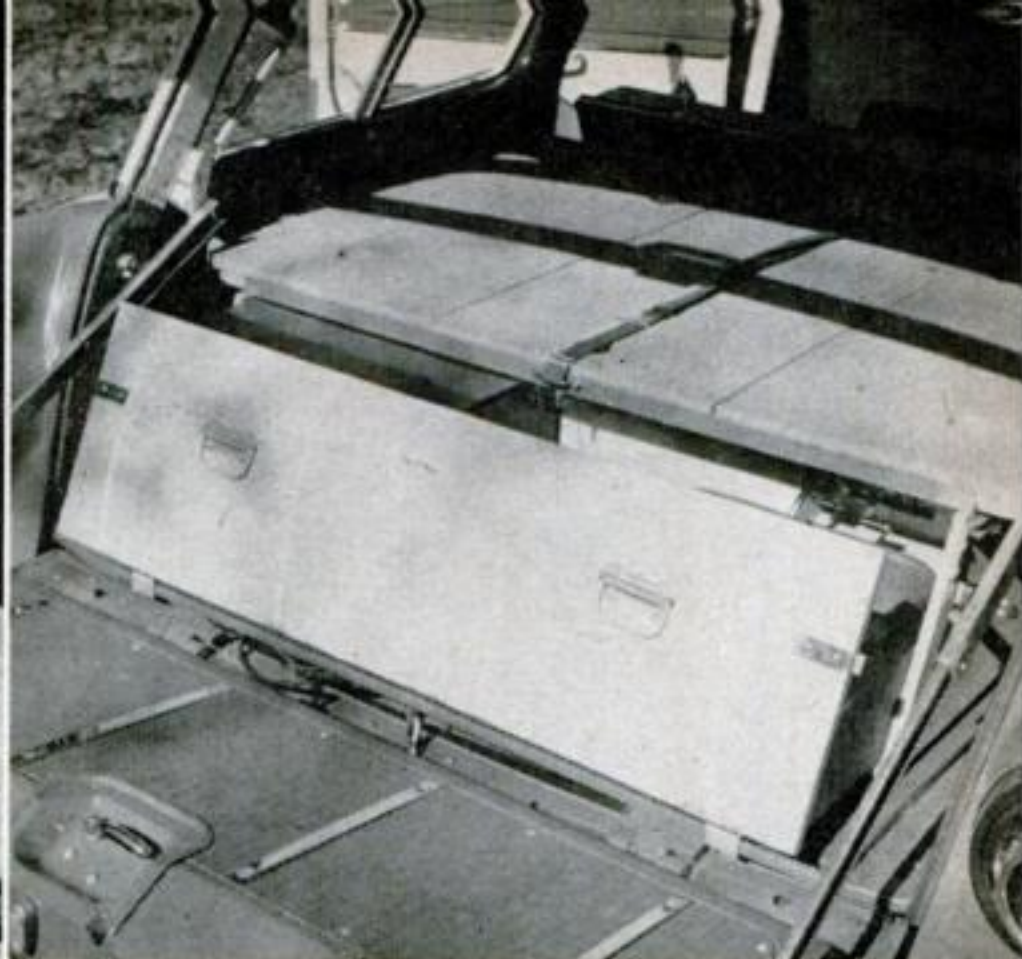
Lightweight tent "pops" open and looks like a greenish igloo

ONE OF THE NEATEST of the new gadgets is the Pop-tent. To set it up (from left, below) you open the 10½-pound bag, insert six fiber-glass





CRANK THE PUMP and out comes cool water for cooking and cleaning up. Recessed drawers beneath and storage compartments behind hold an



ample supply of pots, dishes, silverware, and basic food supplies. Folded up and slid forward, the kitchenette leaves stowage area on top.

their elaborate tents for the first time, whose tottery structures collapse at a breath of air. Or about those who slop stove gasoline on the canvas and achieve a burst of incendiary glory, or who mosey dolefully about remote campsites searching for a place in which to plug electric appliances. Some gadgets they carry may evoke a now-I've-seen-everything response, as for example a strap-on set of coat hooks, to be buckled to any tree.

Everybody was a greenhorn once, however, and a great deal of the new gear makes solid good sense. New car-top

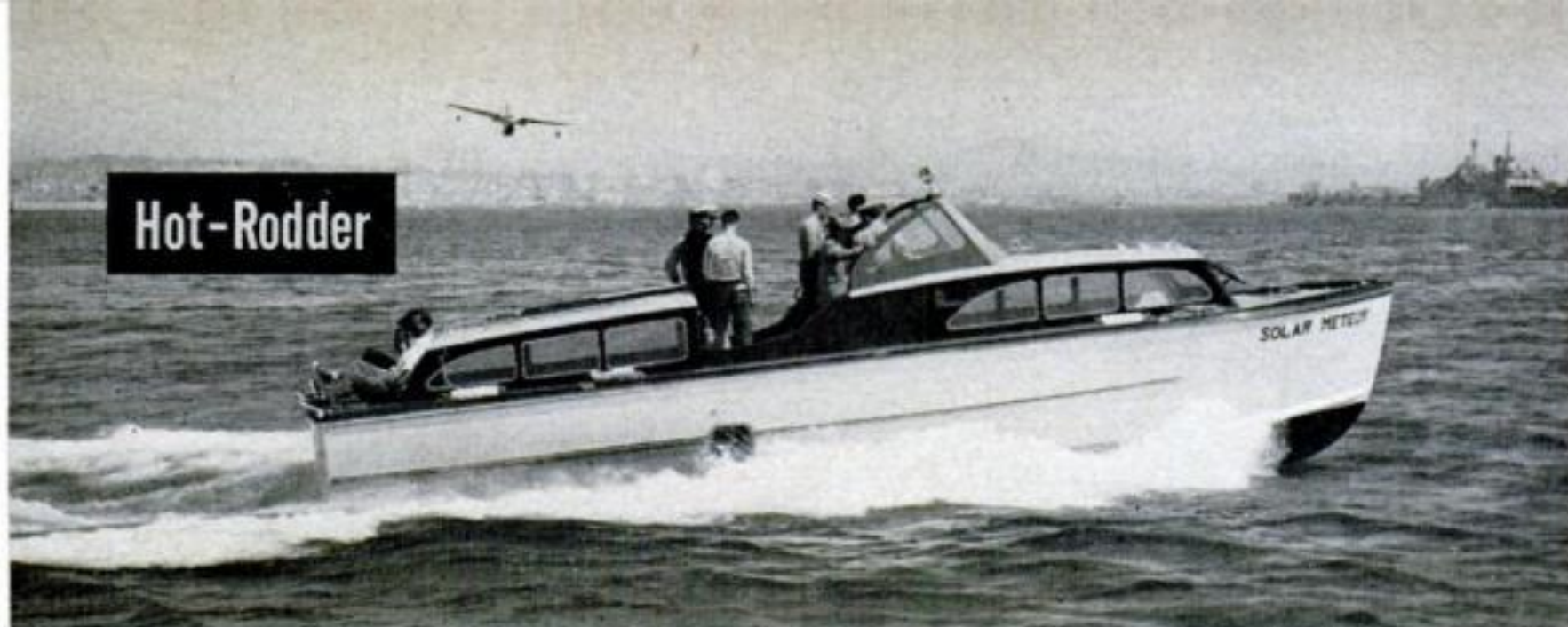
cargo and boat carriers use chain and turnbuckle tie-downs, eliminating the hallowed ritual of retightening the straps at every gas stop. Cutting a bed of balsam boughs may sound like a fine notion, but air mats are notably easier on both trees and sleepers. And the Pop-tent—the igloo job—is an ingenious and clever shelter, eminently suited to station-wagon camping.

Devices like these are a factor in the current rush to the woods. They help spread the word that camping doesn't *have* to be uncomfortable to be fun. **END**

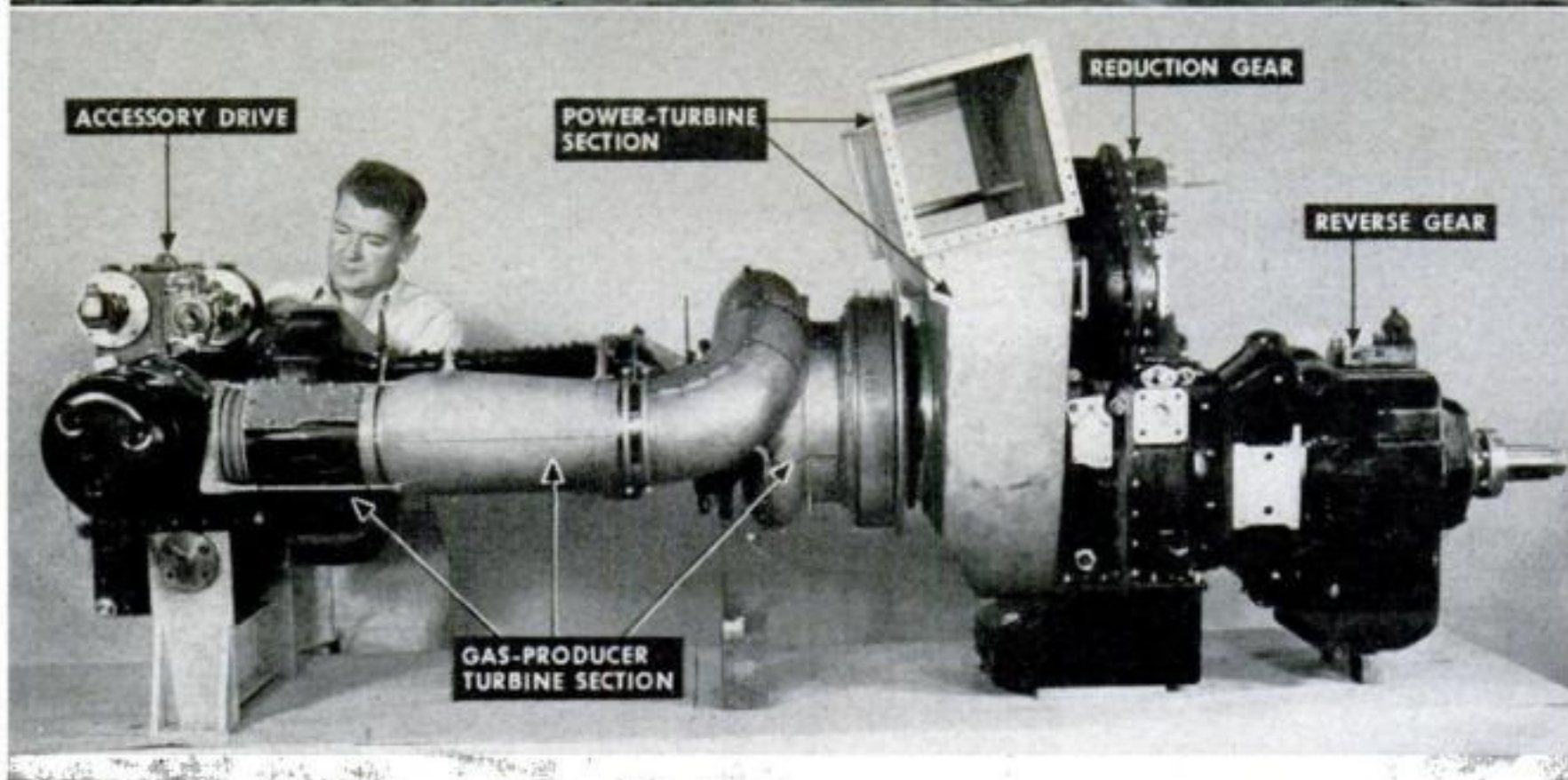
ribs in their pockets, and stand the rig upright like a closed beach umbrella. Then you press down on top until the ribs are bowed, tighten

a lock wheel on top, and then swing it out to one side. The stressed ribs pop outward, stretching the lightweight canvas until it is taut.





Hot-Rodder



Navy's Powerful Gas Turbine to Double Landing-Craft Speed

THIS 500-hp. gas turbine, a fourth the size of comparable diesels, sent the Navy launch above skimming at 26 knots. Tops with a conventional engine is 12 knots.

The exhaust is so hot that it must be cooled by sprays in the ducts. Built by Solar Aircraft of San Diego, the engine is intended to speed amphibious landings.



Magnetic Device Gauges Thickness of Paint Layer

So accurate that it can measure thicknesses one-sixteenth that of an ordinary sheet of paper, the top-like instrument at left is being used to check paint on a turbine wheel. It works on a magnetic principle and can gauge the thickness of glass, paper, plastic sheets or any non-magnetic material placed over iron or steel plate.

General Electric developed it for quality-control checks on such things as car paint, refrigerator enamel and chrome plating on electric toasters.

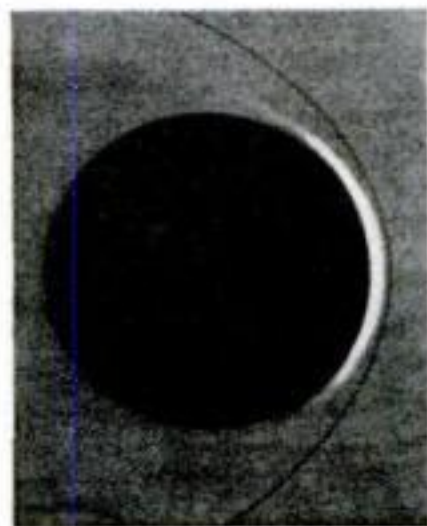


Navy's 40-mm. "hypervelocity gun" is readied to fire, in tests of ultra-high-speed missiles.

Gun Tests 7,000-M.P.H. Missiles

NYLON spheres as big as golf balls flash past a camera at more than 7,000 miles an hour from a missile-testing gun at the U.S. Naval Ordnance Laboratory in White Oak, Md. Never before have projectiles so large been fired so fast. The trials may help to develop intercontinental missiles and future spaceships that will crack the "heat barrier": destructive heating by air friction at extreme speed.

For a propellant, the gun uses helium gas compressed in a breech chamber and suddenly heated and expanded by steam from burning hydrogen and oxygen. Bursting a blowout disk, the gas blast drives the projectile from the bore, which is exhausted of air before firing to avoid back pressure.



CLOSE-UP VIEW shows a marble-sized nylon sphere being fired at 17 times the speed of sound through rarefied xenon gas, whose low pressure simulates 80,000-foot altitude. Visible ahead of the missile are shock wave (curved dark line) and glowing crescent of ionized gas at a temperature hotter than the sun's surface.



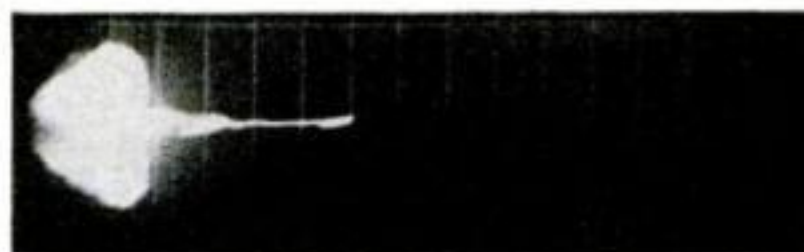
SPEED-CAMERA SEQUENCE studies flight. The gun blast is so hot that it is luminous.



AT 7,840 M.P.H., too fast for the camera to stop it, the round missile looks elongated.



12,200-FRAME-A-SECOND SHOT shows travel of speeding missile against a ruled screen.



MISSILE HAS SPED five feet in final photo. This projectile was size of a golf ball.



How a hurricane looks on radar.

Can We

Weathermen expect to try



A hurricane starts small as a rising column of warm air heated by the tropical sun



If the rising air mass becomes very large, rotation of the earth makes it spin like a top, generating violent winds that whirl counterclockwise in the northern hemisphere. Such a tropical cyclone becomes a hurricane when its winds top 75 m.p.h.



Normal development of hurricane, shown in paintings above, may be unbalanced by effects

By Ernst Behrendt

THE U.S. Weather Bureau is going to *do* something about hurricanes this year. Its scientists will try to learn how to steer one.

If their experiments work, full-scale hurricane control may follow, although it would take years to perfect. The vicious tropical storms could then be guided away from land to blow out their gales and dump their floods over empty ocean. Disasters like last fall's Connie and Diane would become as much terrors of the past as the Black Plague.

The weathermen hope to change slightly the course of a hurricane by seeding it—scattering pellets of dry ice into its clouds. This may release energy from the storm, unbalancing it and changing its course. They will work on a hurricane far away from land, because no one knows for sure what seeding will do. Actually, the Weather Bureau is still skeptical that seeding will do anything, good or bad. But as one specialist puts it, "Hurricane control is such an important subject that we cannot afford to overlook any possibilities."

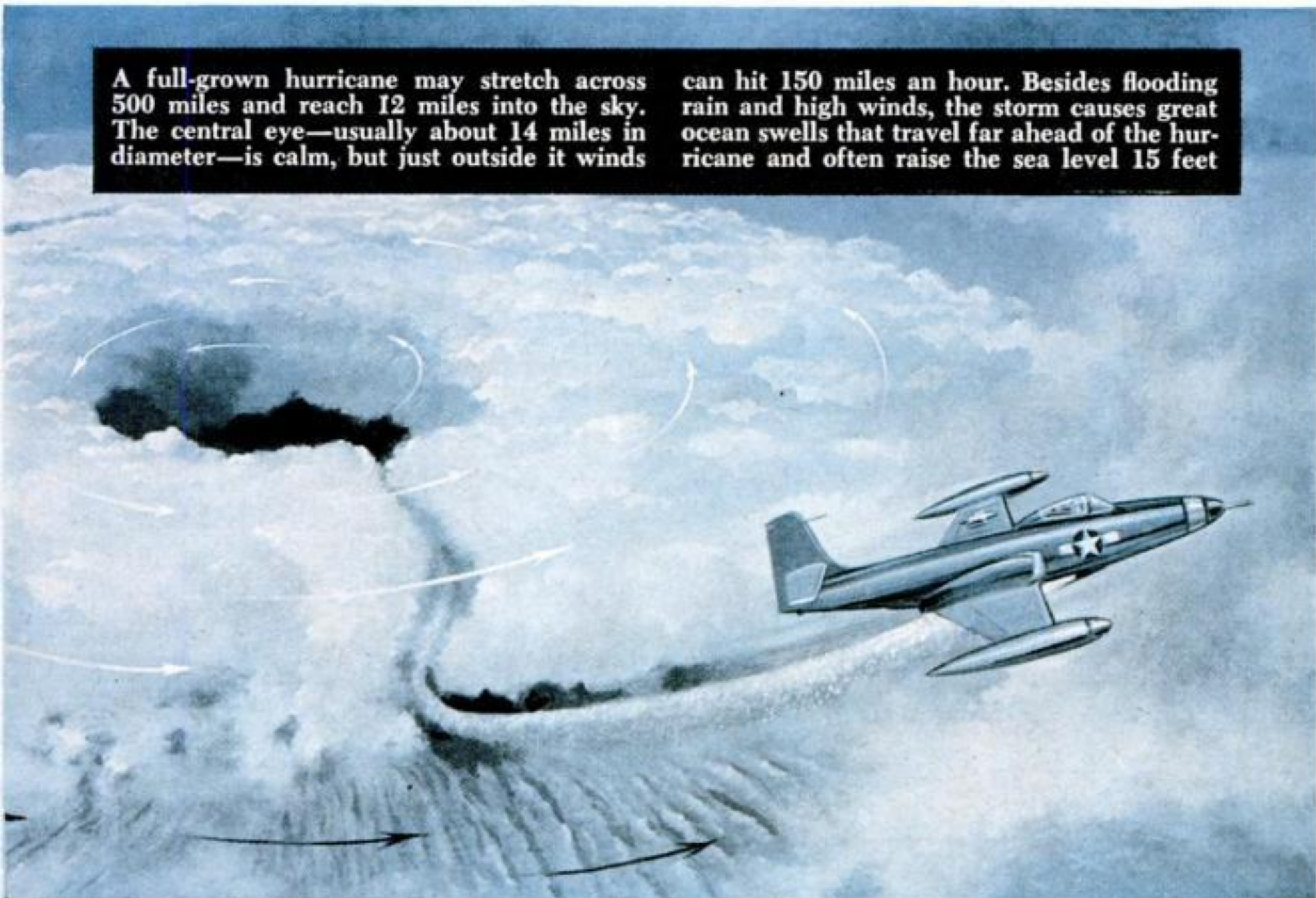
The seeding trial is only part of the

Steer Hurricanes Away?

just that this summer, by seeding a storm with dry ice.

A full-grown hurricane may stretch across 500 miles and reach 12 miles into the sky. The central eye—usually about 14 miles in diameter—is calm, but just outside it winds

can hit 150 miles an hour. Besides flooding rain and high winds, the storm causes great ocean swells that travel far ahead of the hurricane and often raise the sea level 15 feet



of dry ice strewn on it from planes. This might change its course and send it safely out to sea.

National Hurricane Research Project, an all-out search for the causes and cures of hurricanes. Beginning this spring, teams of government and university scientists headed by Robert H. Simpson, Director of the Project, will probe, test and measure the lethal storms roaring up from the Caribbean. They will use every tool and technique in the book:

- Rockets will carry cameras 100 miles above the earth to snap pictures of an entire hurricane.
- Airplanes—two B-50s and a B-47—loaded with new instruments will patrol the seas where hurricanes breed.
- A hurricane beacon—a radio-carrying balloon set to fly at a constant altitude—may be placed in the eye of a storm so that ground observers can follow its radio signals and track the storm.
- Electronic brains will try new forecasting methods, using daily reports from 28 weather stations, U.S. and foreign.
- Special studies of many hurricane characteristics will be made. These include investigation of the hurricane surge, the sudden rise in ocean level that floods low-lying areas and causes most hurricane deaths. Also under way is a detailed study of sea surface tempera-



Jets like this Banshee, shown over 1955's Connie, will probe hurricanes for research project.

tures, which may forewarn of hurricanes.

The attempt to steer a hurricane by seeding depends greatly on the wide-ranging research of the entire Project. Seeding will be tried only if the pre-

liminary studies indicate that it may succeed.

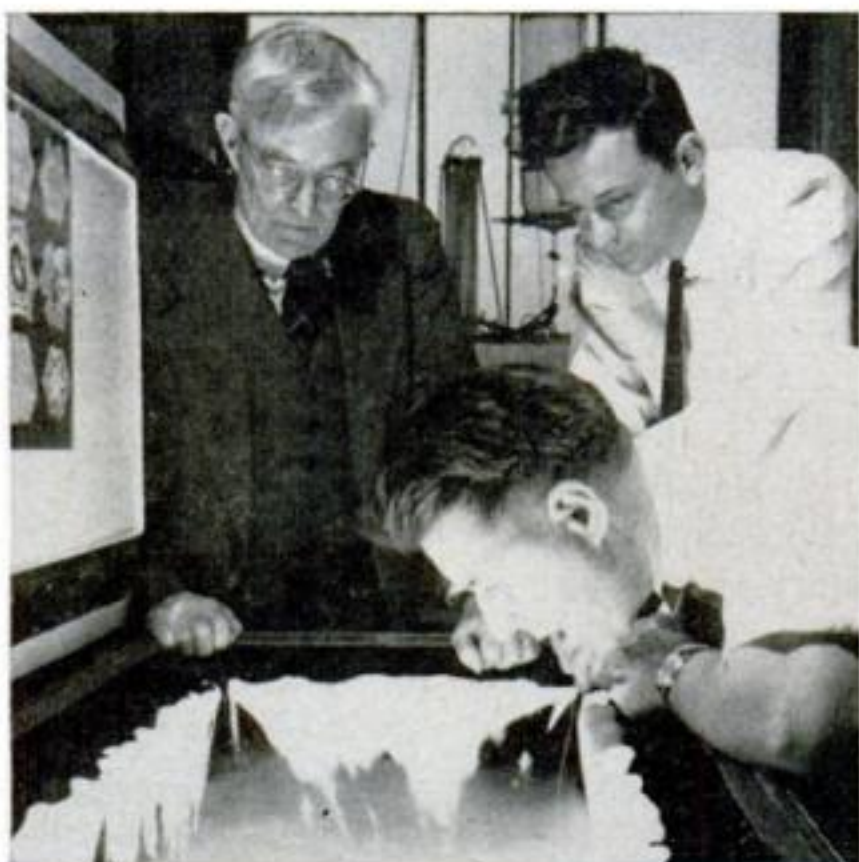
How seeding works. Dr. Irving Langmuir, Nobel-Prize-winning scientist who pioneered cloud-seeding, compares it to setting a match to a haystack. You touch one corner, and fire spreads to the whole stack. In a haystack, the heat of one burning blade of hay sets fire to the next.

Cloud seeding, Dr. Langmuir explains, causes a similar release of pent-up energy. It serves as a trigger. But the process is a bit more complicated.

First, you sprinkle cherry-sized pellets of dry ice on a cloud—it must be a super-cooled cloud, its temperature below freezing. The dry ice immediately produces tiny ice crystals. Each crystal becomes a nucleus around which more moisture from the cloud freezes. This forms snowflakes of rapidly increasing size, which fall through the cloud. When the snowflakes reach warmer altitudes they melt into rain.

“Dry ice is like the germ of a disease

[\[Continued on page 224\]](#)



PIONEER SEEDERS, Drs. Irving Langmuir, Vincent J. Schaefer and Bernard Vonnegut, use a kitchen freezer to show how dry-ice pellets can change a cloud of moisture into snow crystals.



Plan Would Remodel Waikiki Beach for Bigger Tourist Trade

THE model above is Waikiki Beach, re-designed by students at Cornell's College of Architecture to accommodate more than twice as many tourists and still re-

tain its atmosphere. It is being sent to Hawaii where a 10-year plan to increase visitors from 100,000 to 280,000 a year threatens congestion of this area.

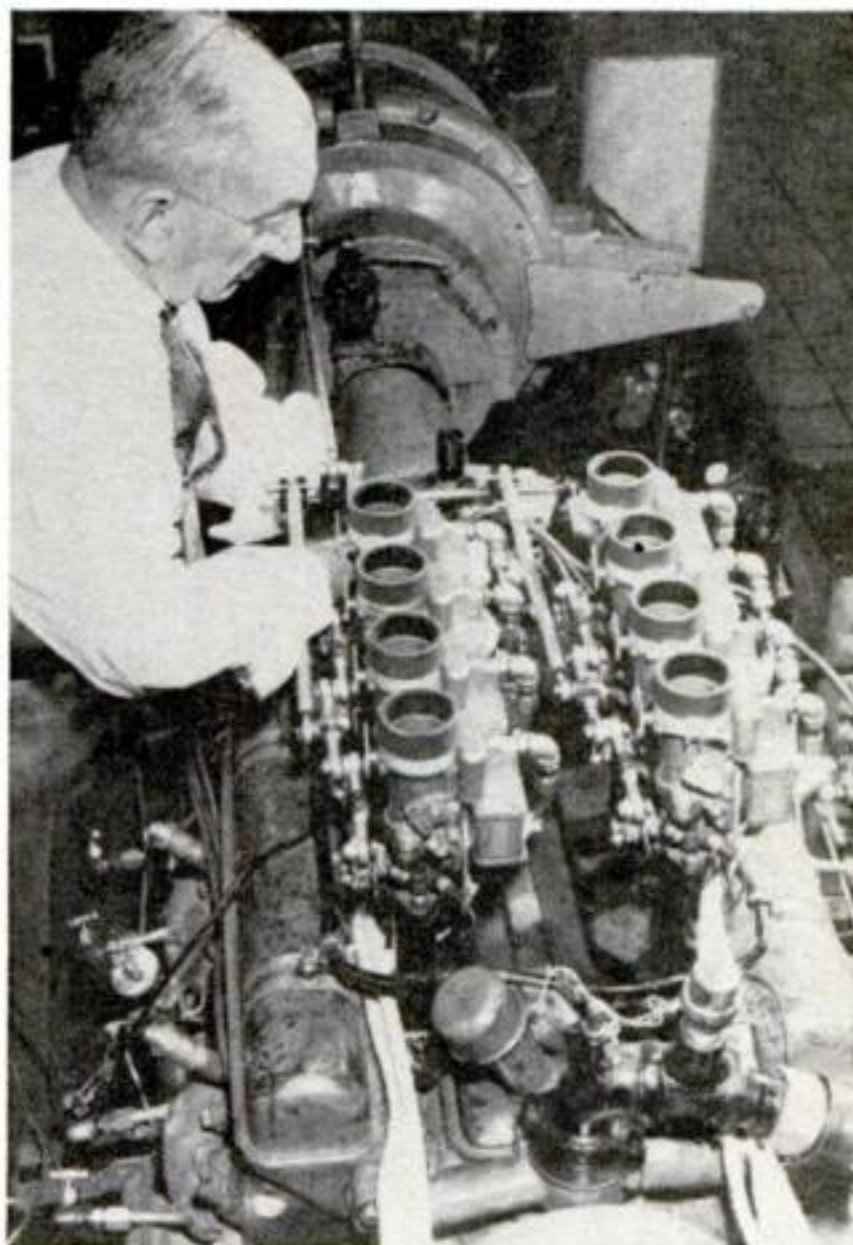


Football Takes to Great Indoors

SO THE Buckeyes' practice can't be held up by rain, sleet or snow, Ohio State is building this indoor football field. It has a clear span of 200 feet.

Auto Engine Has Eight "Pots"

THE special engine at right is fitted with eight carburetors. It permits Esso researchers to test and compare eight experimental gasolines at one time.



One-Man Observatory Spies on Pheasants



PHEASANT OBSERVER Francis Kessler uses anemometer to measure wind velocity within a few inches of ground, in study of "microclimate" around a nest. Fenced-in, five-acre plot near Delaware, Ohio, is the site of his observatory.

IT'S a small world, with a climate all its own, deep in tall grass where a hen pheasant hatches her eggs. And no one but a pheasant knew much about it until Francis Kessler, Ohio State University graduate student, set up a miniature observatory for the Ohio Wildlife Research Unit. Now he's recording how well the eggs are tended, their individual temperatures, and the "microclimate" near the hen's nest.

Better hunting and fishing is the aim of some 200 such fact-finding studies in progress at 17 wildlife research stations from Alabama to Alaska. Kessler's findings, for example, will tell conservation officials what types of food and cover plantings are best for nesting pheasants. And game-bird breeders will learn which nesting habits of hybrid pheasant strains promise the biggest hatches of young birds.—George Laycock.



MOTION STUDY tells when hen pheasant shifts position on eggs, leaves nest, returns. Bird's weight, on wire through nest behind stake, trips microswitch in this box. Usually bird is away from nest 45 minutes daily, the device shows.



TEMPERATURE near ground is recorded by thermograph that Kessler is preparing for use. He gauges rainfall, too. His instruments' data will show how weather conditions near a nest affect a bird's success in hatching her eggs.



RECORDING CENTER of Kessler's observatory registers egg temperature on moving chart in commercial-model recorder at left. He's adjusting a device of his design to clock pheasants' movements. Paper sheets keep 24-hour records.



PHEASANT EGG has its own temperature measured by thermocouple attached with plastic cement. Kessler finds some hen pheasants do better than others in keeping their eggs covered, indicating a trait to be sought by game-bird breeders.

Want to buy a Ford at 86 horsepower?



Fanciest British Ford is two-tone Zodiac.

FORD cars of 59 to 86 horsepower were put on sale all over the U.S. last month. They are really Fords—the genuine article. They really have only a bit more horsepower than the Model A Ford boasted of 25 years ago.

These Fords aren't home-grown. The home-grown ones start at 137 horsepower and streak on up. The Fords of timid horsepowers are built by Ford Motor Co., Ltd. of England.

The British-built Fords introduced last month come in three versions. The Consul, at 59, is the lowest in horsepower. The Zephyr and Zodiac, at 86, are top hole, old boy!

Styling of the Zodiac, pictured here, shows its kinship to Detroit. It even has the new crushable steering wheel to ease the impact on the driver in case of a crash.



It seats six, has a 20-cubic-foot trunk.



Fork-Lift Truck Stacks Cars to Multiply Parking Space

ONE way to conserve parking space is by this method which is being tried out in a British parking lot. A fork-lift truck parks and unparks each car on prefabricated racks.

Its forks adjust for different-size autos. The system was invented by Clifford Fitch, Wire Products and Machine Design, Ltd., Sidcup, Kent.



Automatic Seat Moves Six Ways

OPEN either door of this Oldsmobile Starfire convertible and the seat moves back to let you get in. Fold the back down, and the seat moves forward for rear passengers. The new power seat also has up, down and two tilt positions.

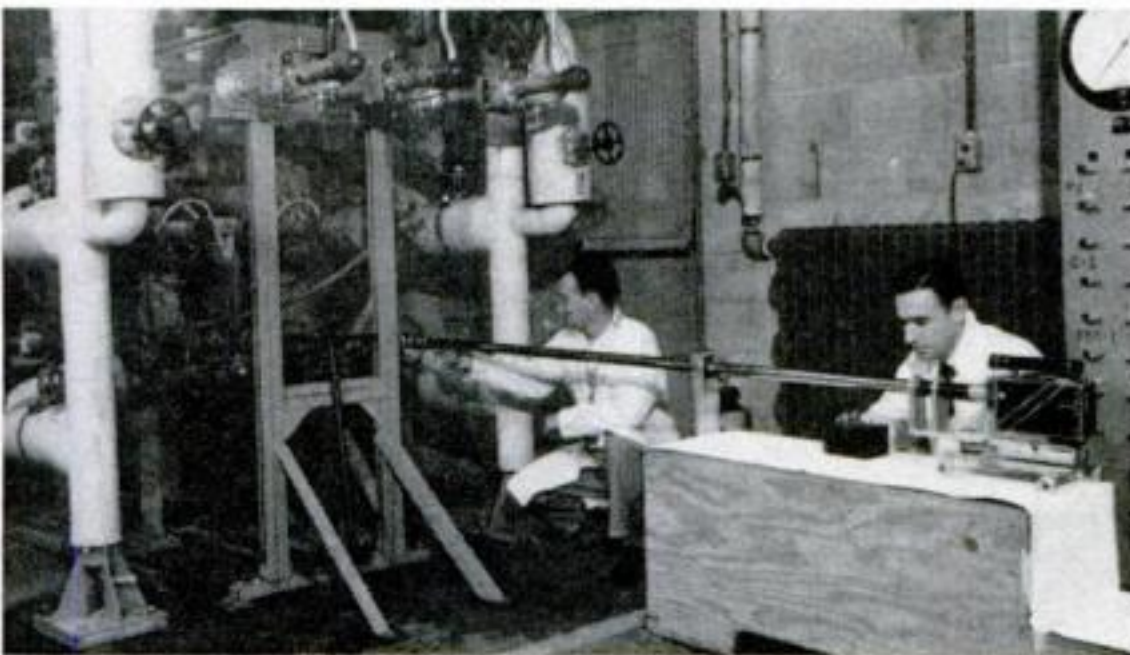
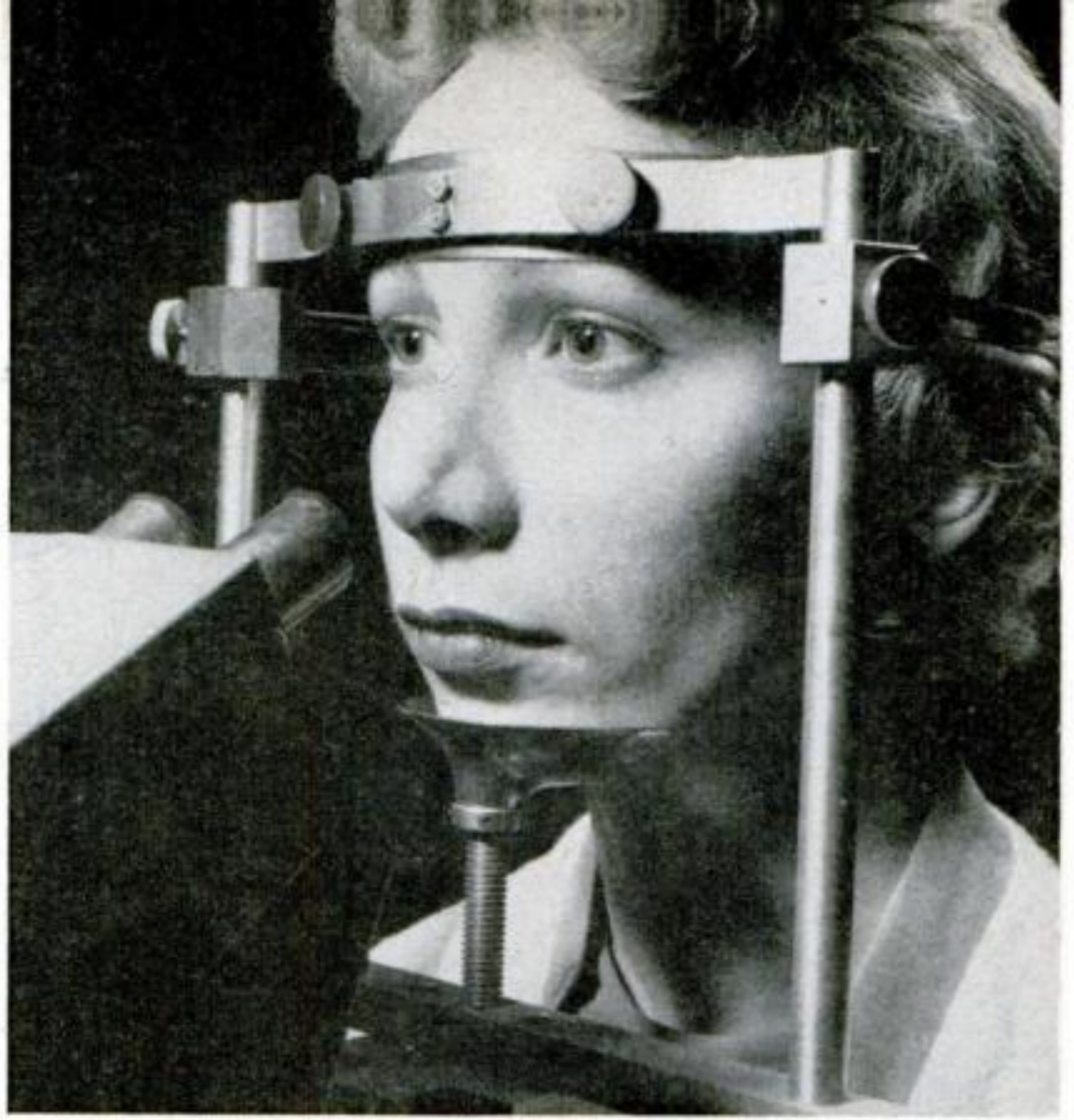


Three-Cylinder Auto Hits 70

THIS new Swedish Saab "93" packs a three-cylinder, two-stroke engine that gives it a top road speed of around 70 m.p.h. With its 46-cubic-inch piston displacement, it develops 37.5 hp. The car will sell in the U. S. for under \$2,000.

Camera Tests Eye Appeal of New Package Designs

TAKING a cue from photographers who used to clamp your head in a vise to keep it still, modern package designers made this harness to help them test the eye appeal of new packages. A camera (left foreground) is focused on a subject's eyes to record their movements and thus rate her interest in packages on shelves within her view. It's a research project conducted by the Folding Paper Box Association.

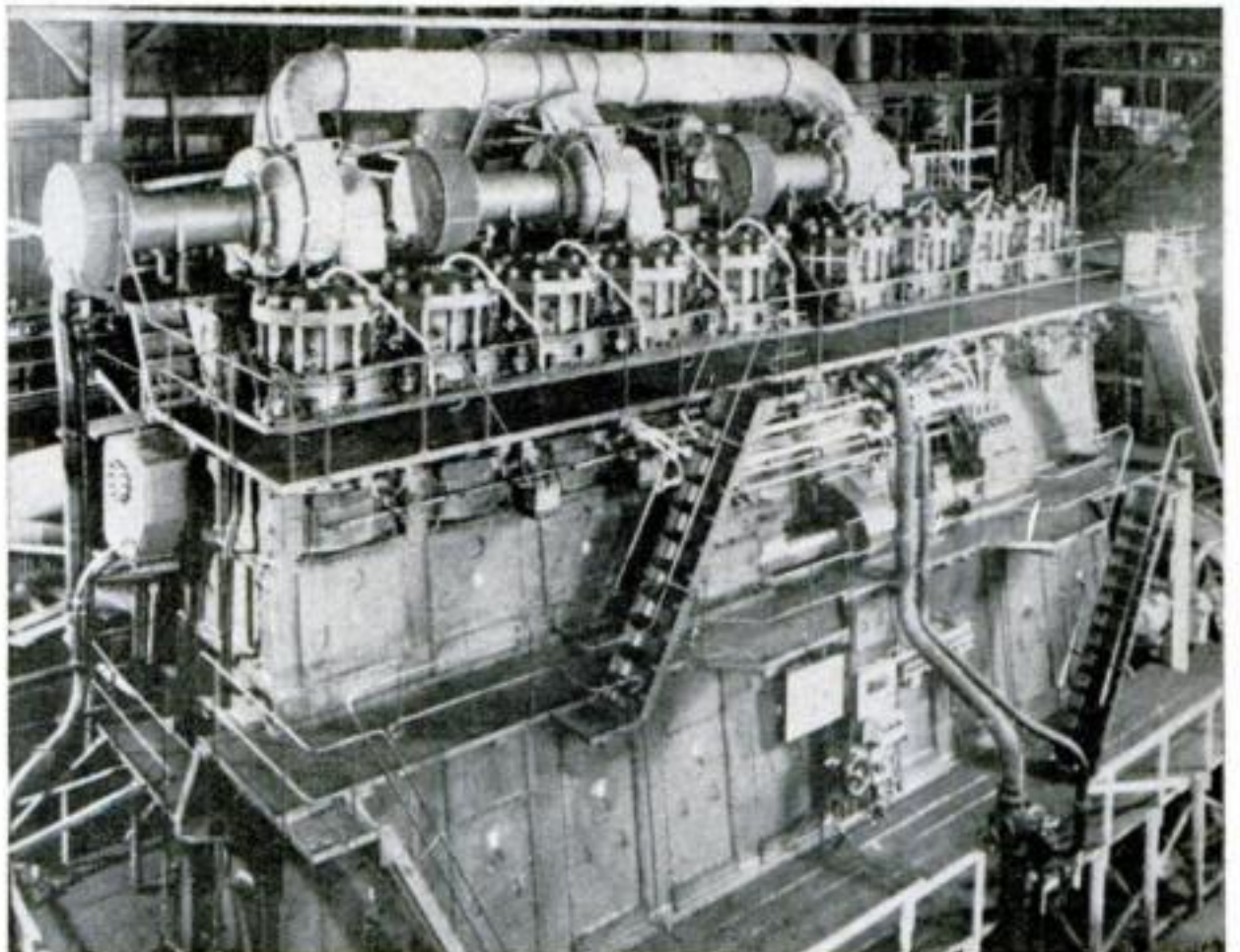


Mobile Lens Takes A "Travel Movie" Inside Reactor Pipes

THE long lens mount on the movie camera at left gives engineers a view of the inside of reactor tubes as they check for damage at the Hanford atomic plant. Its 120-degree lens, moving inside a tube, puts the pipe interior on film.

Nine-Cylinder Diesel Yields Record Power

BELIEVED to be the largest marine diesel engine ever built, this giant power plant has a maximum rating of 13,200 hp. Recently completed, it has been installed in the Japanese cargo boat *Sado Maru*. The nine-cylinder whopper is said to develop the greatest total and per-cylinder output of any diesel in the world.



New in Aviation

Jets Shoot for New Records



Deadliest of the aircraft in the news this month is the Snark (at left), first U. S. guided missile with enough range to cross oceans. Developed by Northrop Aircraft, it can tote an atomic warhead. Guided by radio from Patrick Air Force Base—the site to be used in launching our artificial earth satellites—it has winged 2,000 miles.

Biggest plane is on the drawing board and would be driven by atomic power. Its dreamer-upper, Lee Ohlinger of Northrop, says it could fly almost indefinitely. As a Leviathan bomber, it would tow a flock of fighters until danger developed, then cut them loose. As a commercial “locomotive,” it would tow airliners on airlines all over the world.

Plushiest is a four-jet airliner (at right) just announced by Convair. It will cruise at 609 miles an hour in vibrationless luxury. As a first-class plane, it will seat 80 passengers; as a low-fare tourist plane, 99.





Sauciest plane is a twin-jet Russian Tupolev Tu-104 that flew into London Airport, startling observers this side of the iron curtain. It seats 50 passengers and probably can fly more than 500 miles an hour. Weighing about 75 tons fully loaded, it's about the size of Britain's Comet III.

Experts say that the plane is adapted from the Reds' Badger bomber.

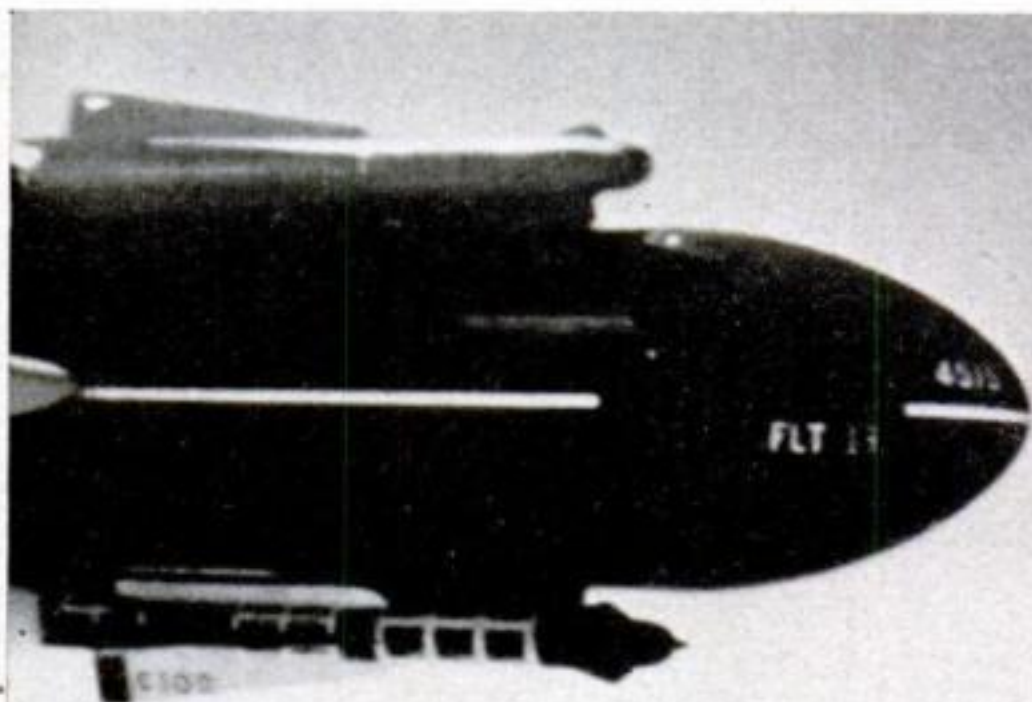


Fastest timed mile ever flown is claimed by Britain for this Fairey Delta 2, which was clocked officially at 1,132 m.p.h. in level flight. U. S. F-104A (see page 74) is reported, unofficially, to be even faster.

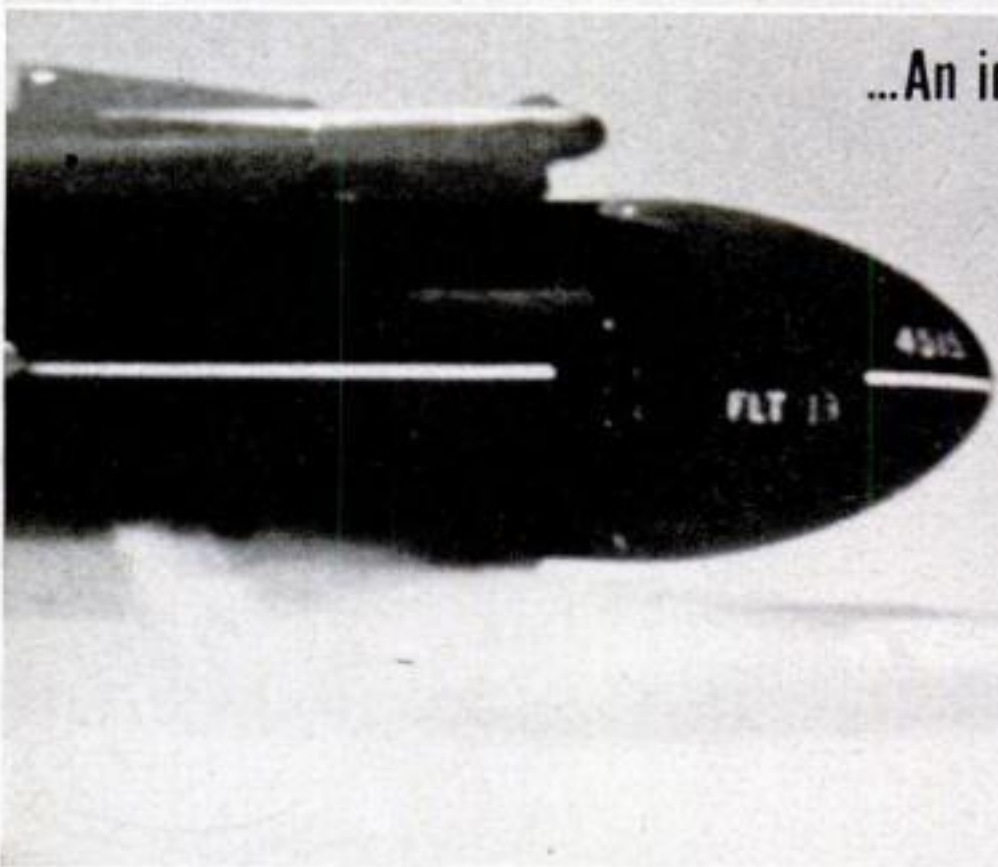
For more picture news in aviation, please turn the page ➡



New in Aviation



A Falcon missile in firing position...



...An instant later it is launched

Airborne Missile A new sting has been added to the Air Force's F-89H Scorpion all-weather jet interceptor. It now carries Hughes

Falcon guided missiles in wing-tip pods. For launching they are extended from the sides (top photo). The F-89H is the first operational fighter to pack this punch.



Tail Test This looks like an accident, but was an experiment—to see whether an Air Force C-130 could withstand repeated pressurizing at high altitudes. The tail section was purposely submerged in a 600,000-gallon pool at the Lockheed plant at Marietta, Ga. Those things on the tail are tension pads to measure strain.



Mobile Shower This trailer-mounted unit provides quick, on-the-spot decontamination for crews exposed to dangerous chemicals while firing rockets or launching guided missiles.



Belly Rotor (arrow) on new kind of helicopter designed by Bruno Nagler of White Plains, N. Y., whirls opposite to main rotor overhead, eliminating torque and the tail rotor.



New Matador A bigger warhead nose and greater length distinguish this TM-61B Martin tactical missile from its predecessor the TM-61, which is now on alert status with the Air Force in Europe. An entirely new electronic airborne guidance system has been developed for the projectile.



Copter Drinks And now the whirlybirds have taken up in-flight refueling. It will enable them to fly farther and carry heavier loads. The Marine Corps helicopter at far left, converted into an aerial tanker, is transferring fuel to a thirsty brother during a demonstration at Quantico, Va. The system used is the probe-and-drogue, which the Navy has found most efficient for mid-air refueling of carrier-based jet aircraft.

Tiny Rooms Show U.S. History



A museum's inches-high pageant of interior design grew out of a girl's miniature dream world.

By George H. Waltz Jr.; photos by Hubert Lockett

THANKS to a little girl's love of dolls more than half a century ago, visitors to Chicago's Art Institute are now marveling at an amazing collection of miniature rooms. Precisely built to the Lilliputian scale of one inch to a foot, these tiny reproductions present a vivid three-dimensional history of the way that people have lived since the Renaissance.

The rooms into which you can peer range from a 13th-century French salon to an ultramodern room in a San Francisco apartment. Seven of the American rooms are shown in full-color photos—for the first time in any national magazine—on the next four pages.

What is the purpose of this unique Thorne exhibit? What can the visitor learn from these miniature rooms? The Art Institute's Curator of Decorative Arts, Meyric R. Rogers, recently explained:

"Picture yourself in a museum of interior design consisting of 67 completely furnished rooms covering the main periods of European and American design. The mind's eye immediately visualizes a monumental building that would require

a visitor to walk miles to see all of the exhibits.

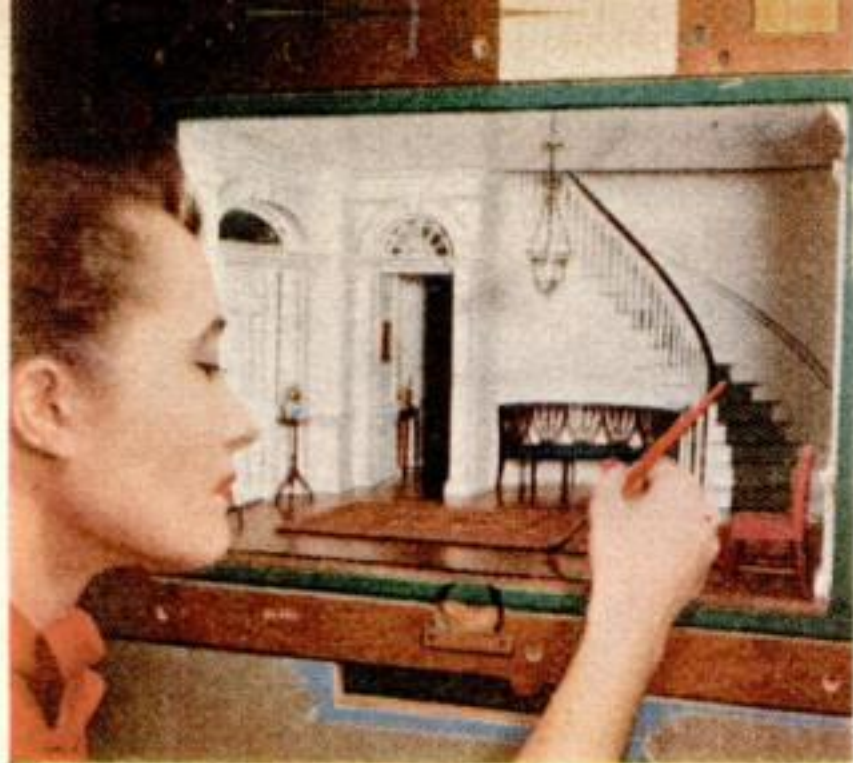
"These rooms give us the essentials of all that in the space of one moderate-size gallery, with every exhibit at eye height. Because a visitor can study and compare the most significant and characteristic examples of the various styles of decoration and furnishings right in one spot, the rooms offer an extraordinary means of vivid visual education in the elements of interior design."

How did it happen that such a costly set of exhibits was built?

Some 60 years ago a little girl in Vincennes, Ind., liked to play with dolls, dollhouses and doll furniture. Unlike most little girls, however, Narcissa Niblack paid more attention to the houses and the furniture than she did to her

[Continued on page 218]

Virginia **MINUTELY CARVED** walnut paneling in this entrance hall is an exact copy of that in Carter's Grove, a fine 18th-century plantation house in James County, Va. The door in picture at top right faces the paneled walls and a graceful archway over the broad stairway and hall. The clock actually keeps time.



Tiny Scale

ENTRANCE HALL above is a reproduction of the one in the famous Peirce Mansion, Portsmouth, N.H., built in 1799. Diminutive size of the Thorne rooms can be appreciated in this picture, which shows the hall getting a "housecleaning" with a small brush. The door in the picture at right leads into the Carter's Grove house, shown below.





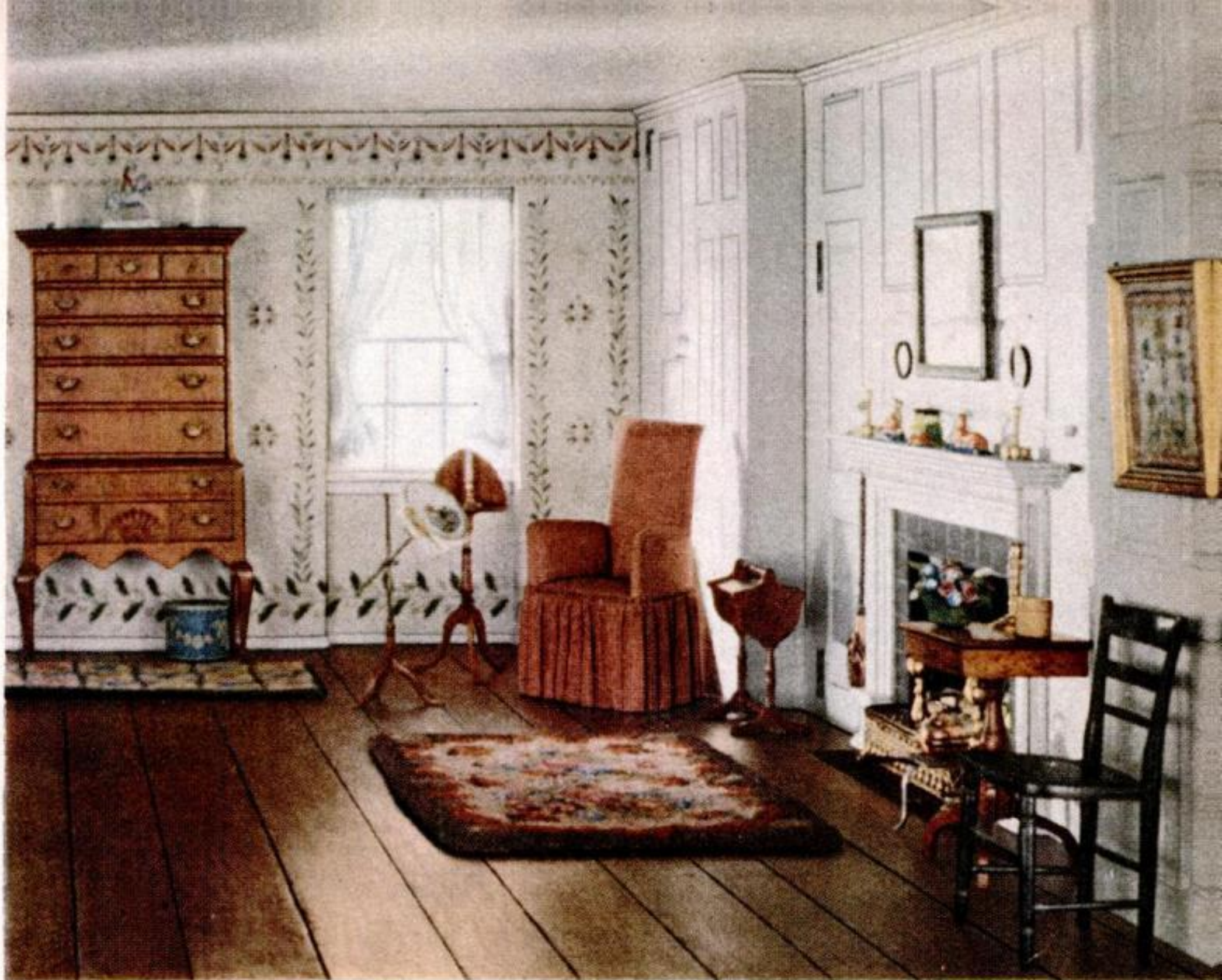
New England

TYPICAL 1840 BEDROOM. One interesting feature in this reproduction is the wall decoration—designs stenciled right on the bare plaster walls. This was an accepted form of decoration in the

South Carolina

CHARLESTON DRAWING ROOM. This model is based on a house built by Col. John Stuart in 1772. The room is furnished with both Sheraton and Hepplewhite pieces. Rugs and screen are Chinese.





days when wallpaper and paneling were too expensive for the average man. The housewife patiently cut out a stencil for a design that she

liked, and the husband did the stenciling. Note the fireplace, the wide, random-width floorboards, and the washstand with its pitcher and bowl.

California

SPANISH INFLUENCE is seen in this reproduction of a living room in the home of George Washington Smith, noted Santa Barbara architect. White walls and architecture suggest style of the missions. *Please turn the page.*





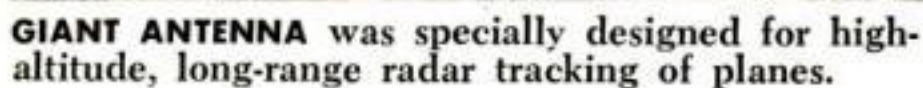
Tennessee

ANDREW JACKSON'S HOME near Nashville, the Hermitage, boasts this gracefully curving stairway. The door at the near left leads into the room that served as Old Hickory's combination office, study and library.

New York

PLAIN LIVING ROOM is typical of the living quarters in the homes that deeply religious "Shakers" built about 1800 in New York, Ohio, Pennsylvania, Kentucky and Indiana. Note the twin chairs and chest-desk.





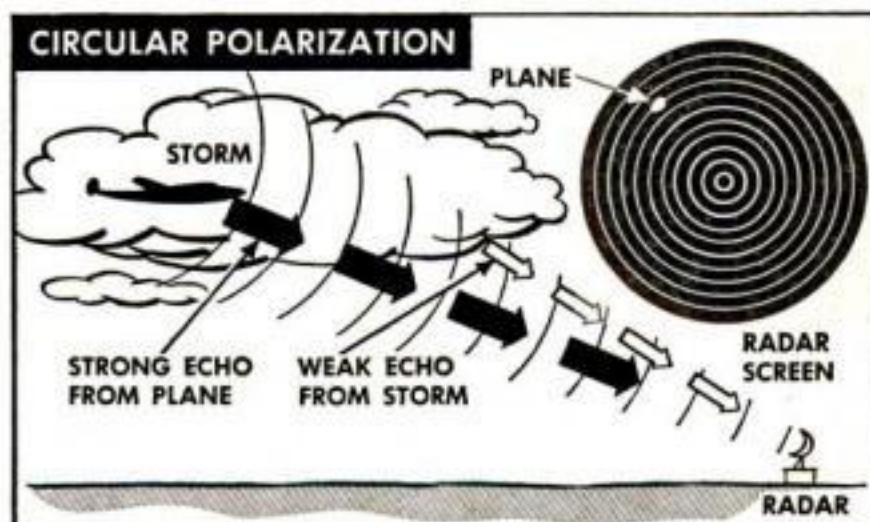
A black and white photograph showing a man in profile, looking intently at a large, circular display. The display shows a map of the world, with various locations and lines, likely representing a flight simulator or a navigation system. The man is wearing a dark jacket. The display is mounted on a wall or a large screen. The map shows the continents and oceans, with several lines connecting different points, possibly representing flight paths or navigation routes. The man's face is partially visible, showing his concentration on the display. The overall scene suggests a professional or military setting, possibly a control room or a training facility.

ELECTRONIC MAP can be superimposed on the radarscope, as above, so that the operator can always pinpoint an airplane's exact geographical location.

feet up. Their main job will be to prevent traffic jams, or stacking, over major air terminals in a 400,000-square-mile area, especially in bad weather.

Delivery of the radar units, being built by the Raytheon Manufacturing Co. at a cost of more than \$5,000,000, will begin early in 1958.

The U. S. Civil Aeronautics Administration is experimenting with similar equipment, on loan from the military, at Norfolk, Va., Chicago, and New York.



NEW RADAR, by changing polarization of beam, filters out echoes from the cloud so that only the plane's image reaches the radarscope.

Doughnut Engine Has Four Pistons in One Cylinder

Auto men are excited by the promise of this compact power pack invented by a famous British engine designer.



Granville Bradshaw

A GASOLINE engine not much bigger than the ones that power many home lawn mowers may actually develop 120 horsepower.

That's what a respected British inventor, Granville Bradshaw, says his latest engine design will yield. It is a one-cylinder, four-piston job that contains only nine moving parts. Bradshaw believes that this mighty mite, which he calls the "Omega," will make the present internal-combustion engine designs virtually obsolete within a very few years.

Automobile manufacturers, both abroad and in this country, are bending interested ears. They remember that Granville Bradshaw designed Pratt & Whitney's first radial aircraft engine, during World War I.

Since then, he has pioneered in developing flat-twin motorcycle engines, motor scooters and oil-cooled engines.

Now, at the age of 67, the millionaire inventor says slyly: "If Detroit's horsepower race ever reaches the point where somebody wants to put a 3,000-horsepower engine under the bonnet [hood], he can do it quite easily with a king-size Omega engine."

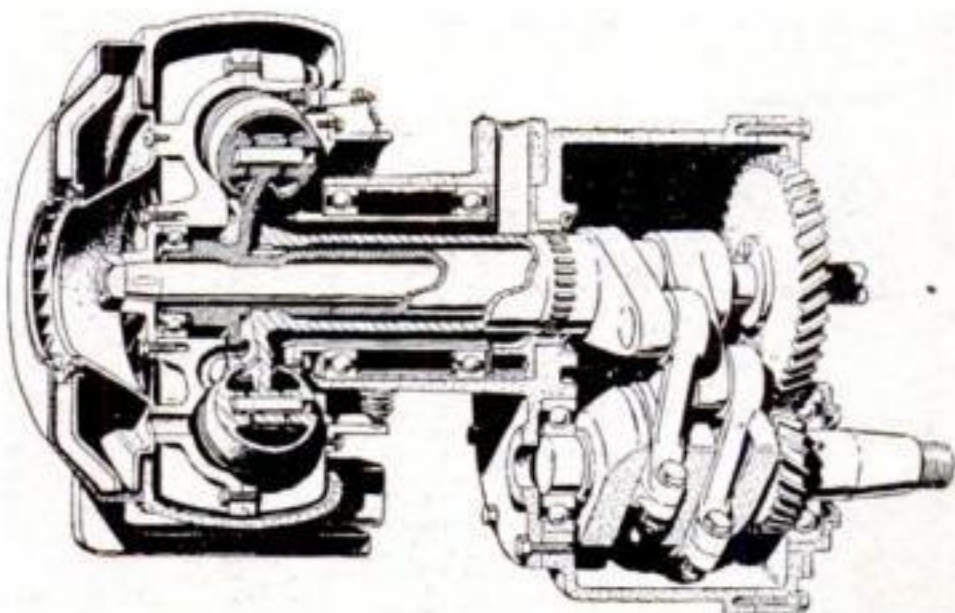
The new engine is revolutionary in action as well as conception. Shaped like a doughnut, it has a single, circular cylinder that rotates continuously around four double-faced, curved pistons. These reciprocate in pairs, transmitting a scissors-like action to a pair of rocker arms that pump connecting rods up and down to rotate the engine's crankshaft.

This ingenious drive eliminates both inertia losses caused by crankshaft reversals, and the big load on reciprocating parts and their bearings.

In a conventional car engine, the alternating loads on the big end of a connecting rod may be around two tons after every crankshaft reversal.

[Continued on page 252]

THE OSCILLATING ACTION of two rocker arms rotates the crankshaft of the doughnut engine. The gears turn the cylinder over once while the crankshaft completes two revolutions.



PLUG FIRES,
START OF
POWER STROKE

END OF INTAKE,
START OF
COMPRESSION
STROKE

END OF EXHAUST,
START OF
INTAKE STROKE

START OF
EXHAUST
STROKE

2:1
GEARS

POWER TO
GEARBOX

POWER
STROKE

COMPRESSION
STROKE

INTAKE
STROKE

EXHAUST
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END OF INTAKE,
START OF COM-
PRESSION STROKE

2:1
GEARS

POWER TO
GEARBOX



Electricity Shifts the Gears on Push-Button Motorcycle

PUSH BUTTONS on the handle bars of this West German motorcycle make shifting a one-hand operation. While working the clutch of the low-slung Victoria, the

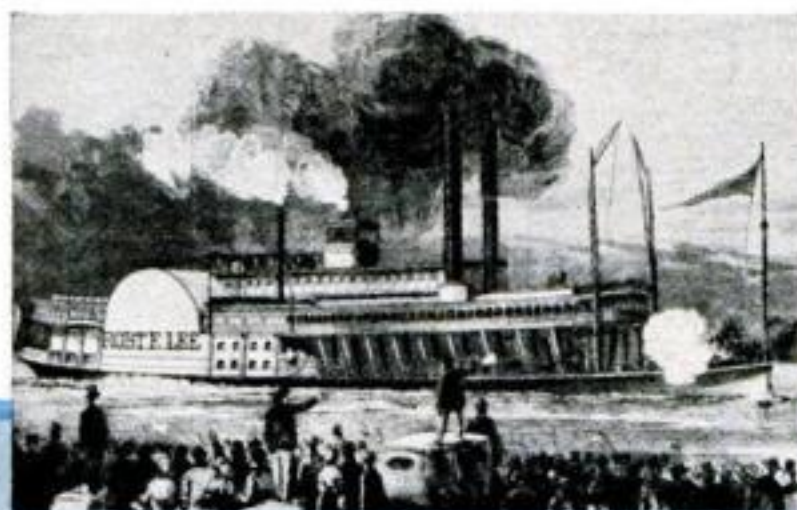
rider presses one of four buttons (inset) with his thumb. This energizes an electromagnetic coil which meshes one of four gears. Button on side is for neutral.



Italians Design Roll-Top Convertible

A ROOF that rolls back in its frame makes a convertible out of this new version of the tiny Fiat 600. Designed along the same lines as an earlier hardtop model, the little gas-stretching Italian auto has a four-cylinder engine mounted in the rear, four speeds, and four-wheel hydraulic brakes. It will seat four.

Daredevil Boatmen Challenge Ghost Ship



Lee Sawyer, with 57-hour run, single-handedly topped feat of the Robert E. Lee (old print).

Racers try to beat the Robert E. Lee's historic 90-hour run from New Orleans to St. Louis.

By Robert Lasch

WHEN the moon shines bright on the Mississippi River this summer, idlers on the shore will see ambitious boatmen racing against the ghost of the steamboat *Robert E. Lee*.

In the dying days of the river's glory, back in 1870, the sidewheeler *Robert E. Lee* raced the *Natchez* from New Orleans to St. Louis. Some 200,000 cheering cit-

izens were on the levee at St. Louis when the *Lee* docked, winner of the river race of the century with a record time for the 1,250-mile run of three days, 18 hours and 30 minutes.

Not long after its great victory, the *Robert E. Lee* burned afloat with a loss of 30 lives, and the river went into a long decline as railroads took over the valley's transportation. Then in this century the river slowly began to come back.

Army Engineers built dams, locks, dikes and a channel. Ponderous barge tows plied the winding course with cargoes of wheat, coal, lumber, automo-



Present Champs of New Orleans-St. Louis speed run are Raymond Loetscher (left, with wife) and Charles Loetscher (right, with wife). The Loetscher brothers and navigator Max Zeiner (rear) set 53-hour mark last August.

biles and even, nowadays, jet planes. Up and down the river, sportsmen took to the water with outboards and cabin cruisers.

So today, when the moon is full and the stage not too high, some daredevil boatman is as likely as not to be driving his craft up the roiling Father of Waters, trying to beat the *Robert E. Lee's* time from New Orleans to St. Louis.

Tradition says that more than 1,000 boatmen have made the try since 1870, most of them during the last 25 years. But only six have both completed the journey and beaten the *Lee's* time.

The river is shorter now, by 200 miles. Its channel is marked. There are drop boxes along the bank where a boatman can pick up Government information on channel and weather. The Coast Guard and Army Engineers patrol the river. At many towns there are boat (or "yacht") clubs, composed of enthusiastic rivermen who are more than glad to help a racing challenger refuel and tune up his motor.

But the Mississippi still finds ways of spoiling the dreams of those who set out on the grueling course.

A heavy rain and a sudden rise can send a flood of driftwood and debris downriver to foul propellers and shatter hulls. An overnight shift in the channel can maroon the boatman on a sand bar,

his motor disabled and his spirit broken.

Many a racer has hit a floating log and come to with his mouth full of muddy water while his boat roared in aimless circles around him.

The big diesel-powered tows set up washes that compel small craft to creep as no racer can afford to do. At some spots on the river in July and August one of the greatest hazards is bugs—buzzing clouds of them, pelting the pilot's eyes, ears and hair, driving him half insane and even

sometimes confusing him into going up some dead-end bayou instead of continuing on the main channel.

Then there is fatigue—the massive, deadening, overpowering weariness that sets in after you have spent a night and a day looking at the same bluffs and cottonwood banks, veering off sand bars and dodging driftwood, replacing sheared propeller pins, refueling at lonely docks, cleaning the motors and putting them back together again, and fighting the relentless current that is always trying to take you back to New Orleans.

This is why only six out of a thousand have beaten the odds. And maybe it's why, each year, boatmen from Missouri, Illinois, Arkansas and points south keep



First in 22 Years to better early contenders' marks, Roy F. Smith (left) and a co-pilot won short-lived championship with their 79-hour upstream run in 1953.

trying to get into the small circle of those who have tried and won.

The first man to beat the *Robert E. Lee's* record was a Memphis doctor named Louis LeRoy. In 1929, aided by a crew of three, he piloted his 26-foot inboard *Bogie* over the historic course in three days, 15 hours and 31 minutes. He beat the *Lee's* time by three hours, and averaged 12 miles an hour.

Dr. LeRoy was the first winner of the Koenig Cup, which is one of the incentives for the Mississippi race. The cup, a towering silver trophy suitable to the majesty of the occasion, was donated by a retired St. Louis businessman, Edwin C. Koenig, commodore of the St. Louis Yacht Club. He wanted to see somebody beat the *Robert E. Lee*, and was generally willing to write a check to go with temporary possession of the cup.

Two St. Louisans, G. F. Schokmiller and George Blaich Jr., took the cup away from Dr. LeRoy by trimming eight hours off his record in 1931. And then for 22 years nobody succeeded in bettering their time.

One of the more spectacular attempts was made in 1952 by Lee Sawyer, a St. Louis electrical contractor who got started in this game through duck hunting. He learned to navigate his outboard at night, and liked it. The longer he fooled around with boats, the more he wanted to undertake the New Orleans-St. Louis adventure.

Unlike all others who have had their names inscribed on the Koenig Cup, Sawyer hankered to do it alone. Nobody has called him the Lindbergh of the Mississippi River race, but somebody might.

A heartbreaking experience kept Sawyer from winning. He could practically smell St. Louis ahead of him when he ran aground on a sand bar 30 miles



Koenig Cup Donor, Commodore Edwin C. Koenig (center), congratulates Frank G. Burkarth (left) and his pilot on 61-hour run in '53. Along shortened river, they were the first to beat the *Lee's* average of 14 miles per hour.

from home, beaten and exhausted. Counting the miles when he was lost, and when he was backtracking for some reason, he had covered far more than the distance between New Orleans and St. Louis, in better time than anybody before him.

But they only pay off when you actually check in at the St. Louis yacht harbor with an official timer, so Sawyer that year, and until 1954, was just another also-ran.

An Alton, Illinois, boat dealer, Roy F. Smith, had a co-pilot with him when he tried for the record that same year, 1952. Smith made it all the way to St. Louis. But as a result of engine trouble, navigation setbacks and running aground on innumerable sand bars, one of which pitched both pilots into the river, Smith failed by some seven hours to break the 21-year-old record.

In 1953, Smith tried again, also aided by a co-pilot, and this time he got his name on the Koenig Cup by shaving 34 minutes off the 1931 record. His time was three days, seven hours and 12 minutes. His boat, powered by two outboard motors, bore the proud name of *Mark Twain*.

Up to that summer of 1953, the *Robert E. Lee* had been doing pretty well. In all the 83 years since its historic race, nobody had really beat its time by very

much. You could argue that the *Lee* was still the king of the river, for it had covered a 1,250-mile course in 90 hours and 30 minutes, an average of about 14 miles an hour, while Smith in piloting his modern craft over a course that had been shortened to 1,050 miles averaged only a little better than 13 miles per hour.

The first complete victory over the *Lee*'s time came in October, 1953, when Frank G. Burkarth, a St. Louis businessman, pushed the average speed up to 17 miles an hour and made the run in two days, 13 hours and 22 minutes.

As river expeditions go, this one was on the de luxe side. Burkarth owned a 37-foot cabin cruiser powered by two 145-horsepower engines. He had a pilot, Capt. John Ritchie of Cape Girardeau, Mo., and a mechanic. One of them could catch 40 winks while the other two handled the boat, so the fatigue problem was minimized. In any case, Burkarth's time was the first significant paring of the record.

Since then, two starters have bettered Burkarth's record. One was Sawyer, traveling alone, who made a time of two days, eight hours and 56 minutes in August, 1954.

A year later, in August, 1955, two brothers who operate a body-and-fender shop in Little Rock, Ark., Raymond and Charles Loetscher, became the present holders of the Koenig Cup. They used a homemade 26-foot boat powered by three V-8 automobile engines rigged to operate in unison. In addition to the Loetschers, the crew included a 22-year-old navigator who had never been on the river before, but who never got lost.

The Loetschers had two notable experiences. At Arkansas City, they were stopped by harbor police for speeding.

Their boat was capable of 45 miles an hour and the speed limit at that point was 20. As soon as the police could be convinced that speeding was the Loetschers' business, the river patrol waved them on with an apology.

The boat hit a sand bar later, near Ste. Genevieve, about 40 miles below St.

Louis, and it took four hours of frantic digging with bare hands to get it back in the water.

After that mishap, the Loetschers sped into St. Louis. Their engines were heated up but they established a new record of two days, four hours and 53 minutes. Their average speed was just under 20 miles an hour. The *Robert E. Lee*'s time had now been shortened from 90 hours to a little less than 53, and that is the mark that Mississippi racers will be shooting at this summer.

All things considered, Lee Sawyer—the man who came close in '52 and made it in '54—remains the most interesting figure in the curious world of river racing. A chunky, burly man of 45 with a beautiful wife and two teen-age children, he seems driven by some fierce inner urge. Reason tells him that the trip from New Orleans to St. Louis can be made in 40 hours, and he is determined to do it before anybody else does—why, he cannot exactly tell.

Sawyer's 1954 run, in which he single-handedly knocked 4½ hours off the record with a time of two days, eight hours and 56 minutes, was beset by troubles that might have daunted a lesser man.

He came to hate the long tows of river barges, which kicked up the water and compelled him to reduce speed. Between New Orleans and Cottonwood Point, above Memphis, he counted 139

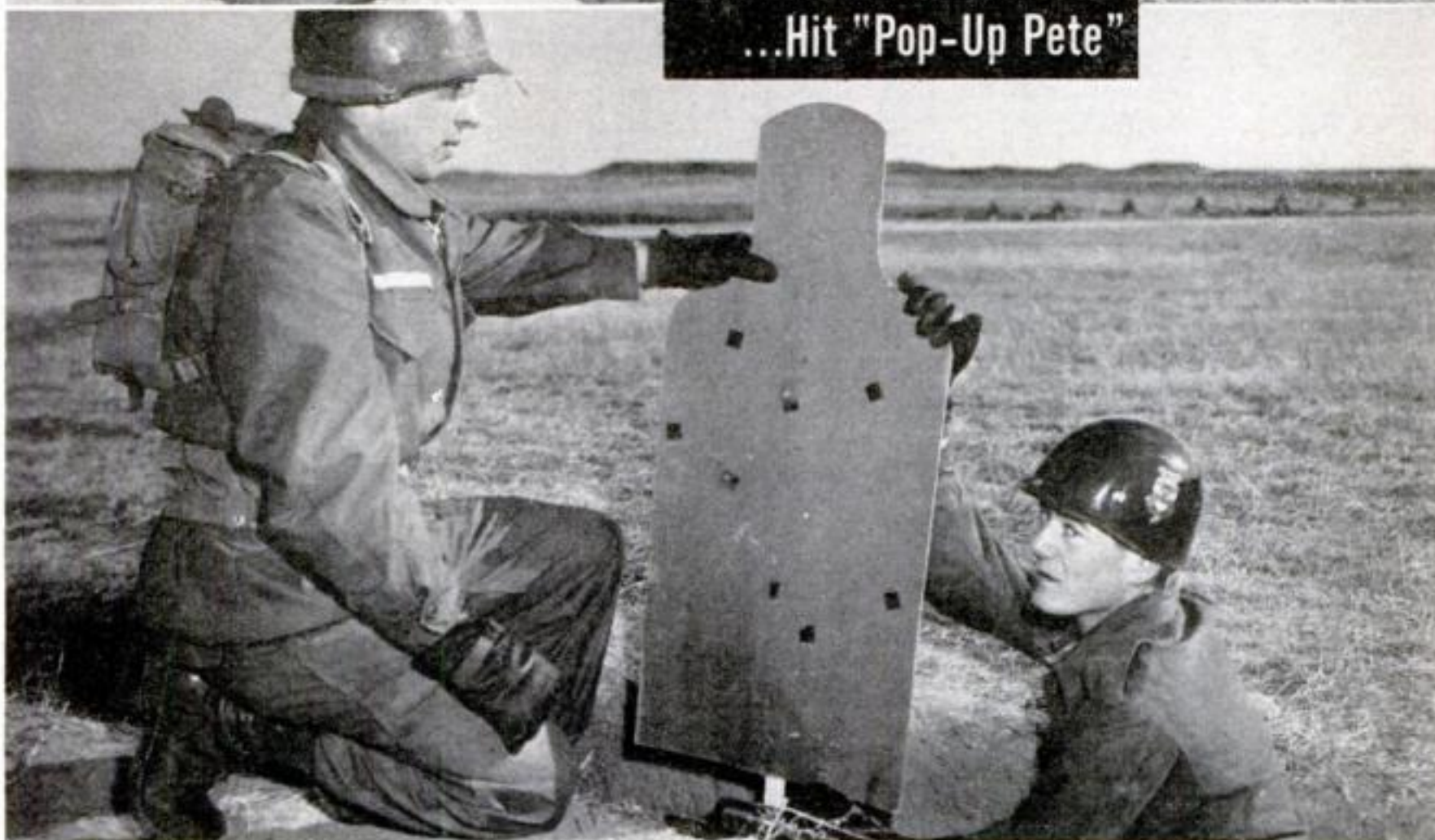
[Continued on page 232]



THESE BIG OUTBOARDS supply the power for Lee Sawyer's boat, the *Huckleberry Finn*, with which he put his name on the Koenig trophy in 1954.



**Foxhole Marksmen...
...Hit "Pop-Up Pete"**



Recruits Get In Their First Licks at Realistic Targets

INFANTRY trainees at Fort Carson, Colo., and at Fort Jackson S.C., are participating in a new "no-dry-run" experiment in rifle training. From the be-

ginning, they fire from foxholes, as silhouettes ("Pop-Up Petes") rise up unexpectedly. The Army hopes that this realism will turn out marksmen faster.



Truck Unloads Feed into Bins Through Hose

LIKE a tank truck delivering gasoline or fuel oil, this pneumatic pumper pipes bulk feed right where the farmer wants it—into his feed bins.

Made by Sprout, Waldron & Co. of Muncy, Pa., the Feed Piper unloads 18 to 24 tons an hour. Its built-in pump works off the truck engine.



What's New

Headlights Built-in spotlights on this East German mechanic's spectacles leave his hands free to work in dark corners. Bulbs and reflectors are mounted on the corners of the plastic eyeglass frames, and a wire runs to a small battery in his hip pocket. The gadget is said to be useful also for reading in bed. The headlights and the other new products pictured on these two pages were exhibited recently at the annual Leipzig trade fair, which since the war has become a show window for technical developments in the Communist countries of East Europe.



Kerosene Radio Made in Moscow for use in rural areas, this all-wave radio is reportedly powered by the kerosene lamp hanging above it. A group of thermocouples is heated internally to 570 degrees by the flame. Fins cool the outside to about 90 degrees. The temperature differential generates enough current to operate the low-drain receiver. Regular listeners may want fur-lined union suits, though: It works best in a room with open windows.

in Communist Countries

Snowdozer The earnest lad at the right is on the prowl for some snow to push around with his new sidewalk snowplow. For maneuvering in close quarters, the wheels can be cramped over to give a turning radius of less than one yard. Engine is a six-hp. four-cycle one-lunger, geared so that the 750-pound vehicle can move deep snow. That big lever raises the blade.



Sturdy Sedan The fifteen Teutons perched atop this little car don't ride about in this fashion; they are simply demonstrating the strength of its light plastic body. The front-drive car, a P70 Zwickau, weighs 1,750 pounds when not festooned with East Germans, which is light enough for it to be propelled at 55 m.p.h. by its 22-hp. two-cylinder engine.



Reverse Engine If the engine under the hood of the Wartburg, above, looks peculiar, it's because it is. The three-cylinder engine is out in front of its radiator. This makes it easier to heat the car's interior in the winter, and also makes space for the transmission and differential of the front-drive car. Developing 37 hp., the little East German vehicle comes in three models—a hardtop, a convertible and a station wagon.

REPORT TO MOTORISTS

Keeping You Out of That Traffic Jam



New devices count cars and do figures in their heads to save you from that awful accordion.

By Devon Francis

THERE is a hilly road in the state of Connecticut that has more curves than Marilyn Monroe, and this summer some funny-looking things will be put up alongside it. They look like lighting fixtures. But they aren't.

They are tools in an experiment designed to keep you out of—or at worst, alleviate—that deadly bumper-to-bumper traffic that plagues motorists everywhere from the time of spring's first crocuses to autumn's first frost.

The results of the experiment on Connecticut's Merritt Parkway, which permits no cross traffic, are being awaited by traffic engineers all over the U. S., including, probably, the experts in your own town.

The funny-looking things, on standards, will be there to count cars. They will work by radar and report their findings to electronic brain boxes at a police headquarters miles away. Teamed with them will be the more familiar radar speed meters, boon of the traffic cop, bane of the heavy-footed driver.

By measuring traffic volume and clocking car speeds, Connecticut's state police expect to determine some of the causes of that great American institution, the traffic jam. It's known to the experts on traffic control as an "accordion."

John L. Barker of the Automatic Signal Division, Eastern Industries, the world's biggest manufacturer of traffic-actuated signal systems that "think," says of the accordion, "If you can keep one from getting started, you've got it made. If you can't, oh brother!"

Finding out why accordions occur isn't as simple a job as you might think. Traffic may whiz along at one point on a road. Five miles ahead, it slows to a crawl. Two miles beyond that, the traffic flow is okay again.

What happens in between? Do cars entering the stream of traffic slow every-



ON PHILADELPHIA'S BROAD STREET, this pedestrian presses a button to get a green light. A master control decides when she can cross.



PAD IN PAVEMENT triggers "local controller" at cross-street intersection as each car rolls over. The signal is then relayed to a "brain."

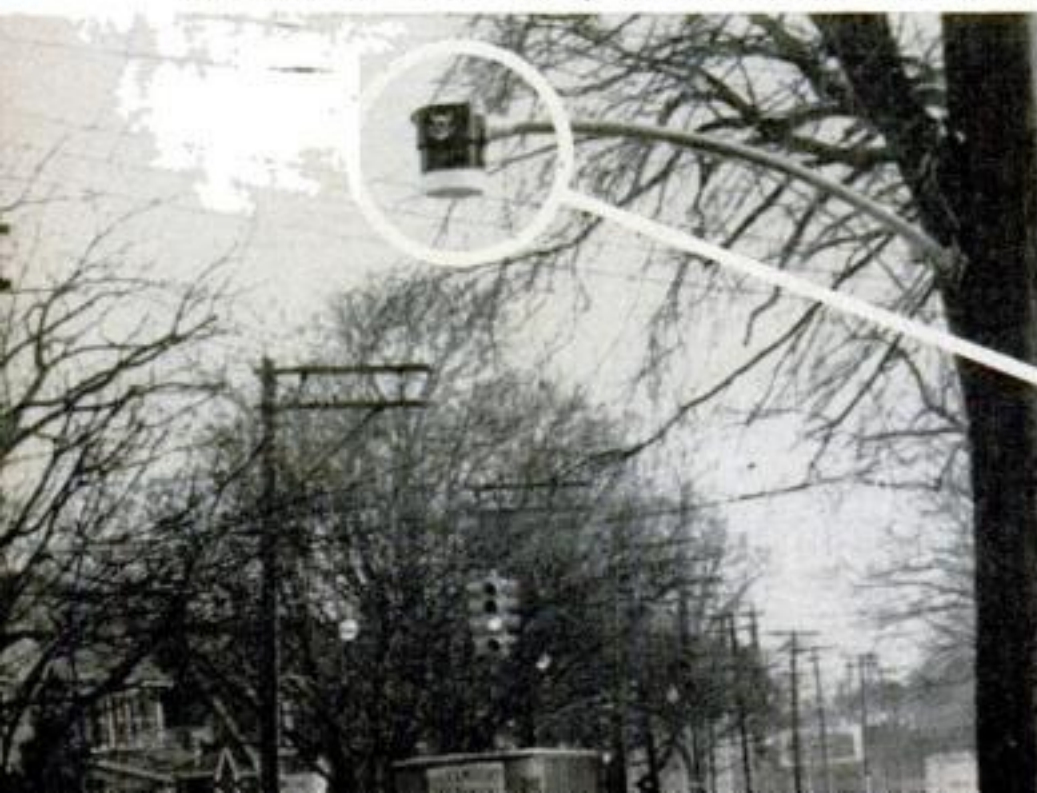


SPEED-DELAY METER, mounted on car seat, is used by Philly traffic engineers to find the driving time from City Hall to outlying areas.



A FAMOUS VISTA, Broad Street looking toward City Hall, is the scene of one of the nation's most elaborate experiments in traffic speedups, using volume-sensitive control signals.

OVERHEAD RADAR UNIT, shown here on a Norwalk, Conn., street, counts cars as pavement pads do, but less accurately. Norwalk is home of Eastern Industries, which made the unit.



thing down? Or cars leaving it? Or both? Is it unequal speeds in adjacent lanes? Lane width? Cars going too fast? Too slow? Is it on account of hard-to-read signs? Poorly marked lanes? Inadequate separation between opposite-going traffic? Bridges with railings so close to the roadway that motorists automatically swerve from them, confusing traffic on inner lanes?

Traffic-control people all over the country would like to have the answers. To help supply them, the brain boxes, newest thing in traffic studies, will digest traffic-flow information and give instantaneous readings at any second of any minute of any hour. They are kissing cousins of the monstrous and awesome electronic computers that perform near-miracles of higher mathematics for science and industry.

The Connecticut study is only one small part of the fight against the traffic jam. All over, the experts are speeding up traffic day by day.

The traffic-responsive, or "thinking," traffic light is the heart of many of the new traffic-control systems. It balances cross traffic against main-street traffic as delicately as a postal weight scale and apportions the time between red and green accordingly.

It's considerate. It "remembers" the motorist who was caught when the light turned red. Presently it says, "Okay, bub,

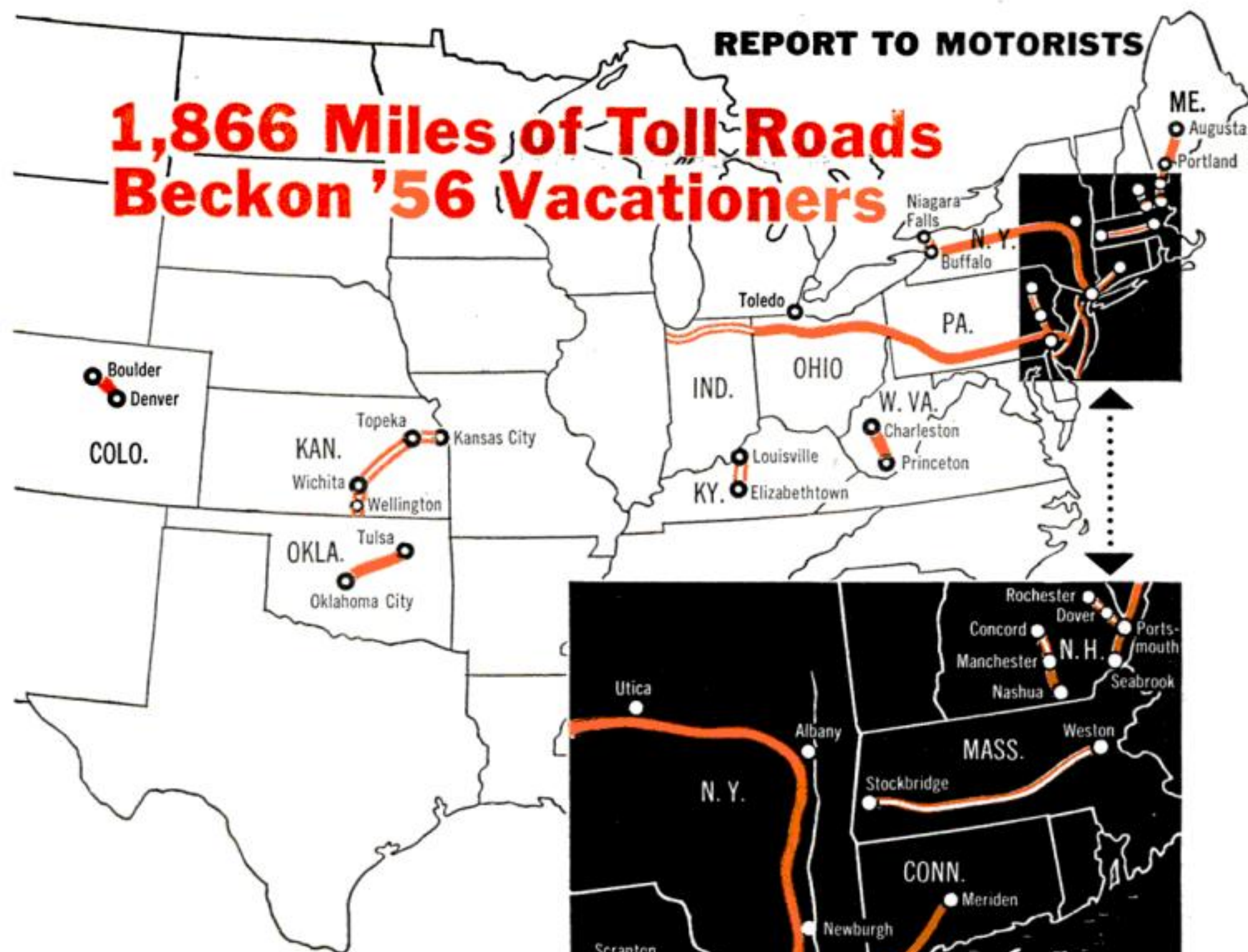
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RADAR COUNTER is in simple plastic case with dome at bottom. It emits microwaves. Each moving vehicle changes the wave length of the reflected signal, closing a counting relay.



REPORT TO MOTORISTS

1,866 Miles of Toll Roads Beckon '56 Vacationers

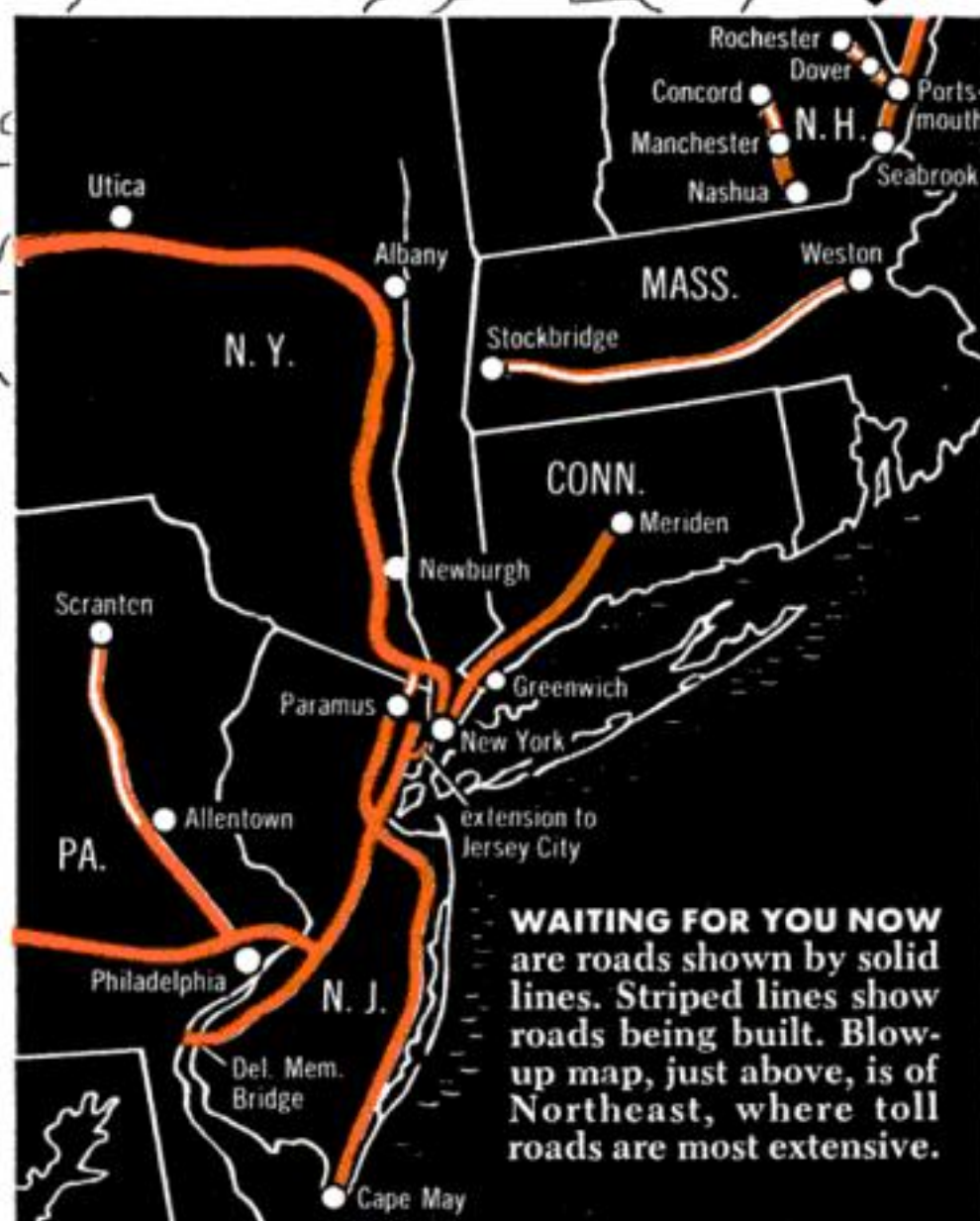


THERE is fresh balm, at this vacation season, for that itchy accelerator foot. More toll highways, unmarred by red lights, lie in wait.

That modest complex of high-speed roads that beckoned to you a couple of years ago—when this magazine first published a map of pay turnpikes—has grown.

Take a look at the new map. In 1954 the toll turnpike mileage totted up to 800. Come July, when a snip of the shears will open Kentucky's new turnpike, the mileage will be 1,866. By November it will be almost 2,300; by January more than 2,500.

Two years ago only 10 states had toll roads, most of them on the densely settled northeastern seaboard. By the turn of the new year, the traffic interchange,

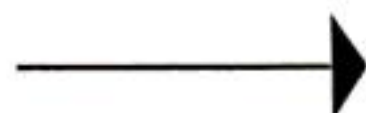


WAITING FOR YOU NOW are roads shown by solid lines. Striped lines show roads being built. Blow-up map, just above, is of Northeast, where toll roads are most extensive.

with its sweeping, parabolic curves, will be a fixture in 15 states, four in the Midwest.

In less than six months from now, that dream of driving from New York to Chicago without encountering a traffic light will be real—on 875 miles of ribbon that cleave Pennsylvania's green-clad mountains and bisect the farm-scented hills and flatlands of New Jersey, Ohio and Indiana.

Please turn the page for complete toll-road information



What you want to know about Toll Roads

STATE	NAME	FROM	TO	LENGTH (MILES)	NUMBER OF INTERCHANGES	TOLL PER MILE (CENTS)	NUMBER OF LANES (EACH DIRECTION)	LANE WIDTH (FEET)	
COLORADO	COLORADO TURNPIKE	DENVER	BOULDER	17	1	1.5	2	12	
CONNECTICUT	MERRITT AND WILBUR CROSS PARKWAYS	GREENWICH	MERIDEN	67	31	*	2	12-13	
FLORIDA	SUNSHINE STATE PARKWAY ^c	HOLLYWOOD	FT. PIERCE	104	8	2	2	12	
	BUCCANEER TRAIL	FERNANDINA BEACH	MAYPORT	17	None	6	1	11	
INDIANA	INDIANA TOLL ROAD ^d	OHIO LINE	NEAR CHICAGO	156	9	1.2	2	12	
KANSAS	KANSAS TURNPIKE ^e	KANSAS CITY	WELLINGTON- OKLAHOMA LINE	236	12	1.6	2	10-12	
KENTUCKY	KENTUCKY TURNPIKE ^f	LOUISVILLE	ELIZABETH- TOWN	40	7		2	12	
MAINE	MAINE TURNPIKE	KITTERY	AUGUSTA	113	16	1.8	2	12	
MASSACHUSETTS	MASSACHUSETTS TURNPIKE ^g	WEST STOCKBRIDGE	WESTON	123	14	2	2-3	12	
NEW HAMPSHIRE	NEW HAMPSHIRE TURNPIKE	PORTSMOUTH	SEABROOK	15	1	1.3	2	12	
	CENTRAL TURNPIKE ^h	NASHUA	MANCHESTER	21	9	1.7	2	12	
	SPAULDING TURNPIKE ⁱ	PORTSMOUTH	ROCHESTER	23	7		2	12	
NEW JERSEY	NEW JERSEY TURNPIKE	RIDGEFIELD PARK	DELAWARE MEMORIAL BRIDGE	118	18	1.5	2-3	12	
	EXTENSION	NEWARK BAY	TURNPIKE	8	4	4.2	3	12	
	GARDEN STATE PARKWAY	PARAMUS	CAPE MAY	164	80	1.4	2-5	12	
NEW YORK	NEW YORK THRUWAY ^j	NEW YORK CITY LINE	BUFFALO	427	53	1.2	2-3	12-13	
	SAW MILL RIVER PARKWAY	NEW YORK CITY LINE	HAWTHORNE CIRCLE	11.1	11	*	2-3	10	
	HUTCHINSON RIVER PARKWAY	NEW YORK CITY LINE	GREENWICH, CONN.	11.2	15	*	2	11.5	
OHIO	OHIO TURNPIKE	NEAR EAST PALESTINE	INDIANA LINE	241	15	1.2	2	12	
OKLAHOMA	OKLAHOMA (TURNER) TURNPIKE	OKLAHOMA CITY	TULSA	88	4	1.6	2	12	
PENNSYLVANIA	PENNSYLVANIA TURNPIKE ^h	OHIO BORDER	EDGELY	470	38	1	2	12	
	EXTENSION	PLYMOUTH	SCRANTON						
WEST VIRGINIA	WEST VIRGINIA TURNPIKE	CHARLESTON	PRINCETON	88	6	1.8	1-1½	12	

NOTES

^aGreenwich, Milford toll stations 20¢, Wallingford 15¢

^bCurbed grass areas on Merritt interspersed with shoulders; 8 ft. on Wilbur Cross

^cTo open January, 1957

^dTo open November 15

^eTo open in October

^fTo open July 1

^gTo open in November

^hOpen Nashua-Manchester; open to Concord 1957

	WIDTH OF SEPARATION STRIP (FEET)	TYPE OF ROAD SURFACE	MAXIMUM GRADE (PERCENT)	MAXIMUM CURVE (DEGREES)	WIDTH OF PULL- OFF STRIP (SHOULDERS)	TOP SPEED LIMIT	NUMBER OF REST OR RECREATION AREAS	NUMBER OF FUEL AND FOOD STOPS	BRANDS OF FUEL AND OIL AVAILABLE
	20	Concrete	5	4	10	65	None	None	None
	20	Concrete	7	6	b	55	2 (Wilbur Cross only)	5	Cities Service, Crown, Trojan
	12	Concrete	3	1.5	10	60	None	3	
	None	Asphalt	2		10-12	60	9	None	
	40	Concrete	4	2.5	10	65		5	Cities Service, Pure, Shell, Sinclair, Texaco
	20	Asphaltic concrete Reinforced concrete	3	3	10		6	6	Phillips, Sinclair, Socony, Mobile
	12	Concrete	3	3	12	60	2	2	Gulf, Texaco
	26	Asphaltic concrete	3	1	10	60	None	6	Cities Service, Esso
	6-18	Macadam Asphaltic concrete	3.5		10	60	None	10 food 12 fuel	
	24	Asphaltic concrete	3	3	10	60	24	None	
	24	Bituminous macadam	4	6	10	60	20	None	
	24	Asphalt	4	4	10	60	None	None	
	26	Asphaltic concrete	3	1.9	10-12	60		12	Cities Service
	4-6	Concrete	3	4.7	None	50	2	2	Cities Service
	5-600	Bituminous concrete, concrete	3	3	10	60	22	7 (and 2 fuel only)	Atlantic, Cities Service, Esso, Texaco
	20-800	Concrete	3	2	9	60	17	25	Atlantic, Calso, Cities Service, Esso, Gulf, Sinclair, Sunoco, Texaco
	Variable	Reinforced concrete	5		m	40	None	2 fuel 1 food	Socony, Texaco
	4	Reinforced concrete	6.5		m	40	None	1	Kesbec
	40	Concrete	3.2	2.5	10	65	16	16	Cities Service, Pure, Shell, Sinclair, Texaco
	15	Asphaltic concrete	3	1.5	12	70	1	5	Phillips
	10	Concrete	3	6	10	70		29	Atlantic, Esso, Gulf, Pennsylvania
		Concrete	5	5.5	9	60	3	3	Esso

¹To open to Dover this summer

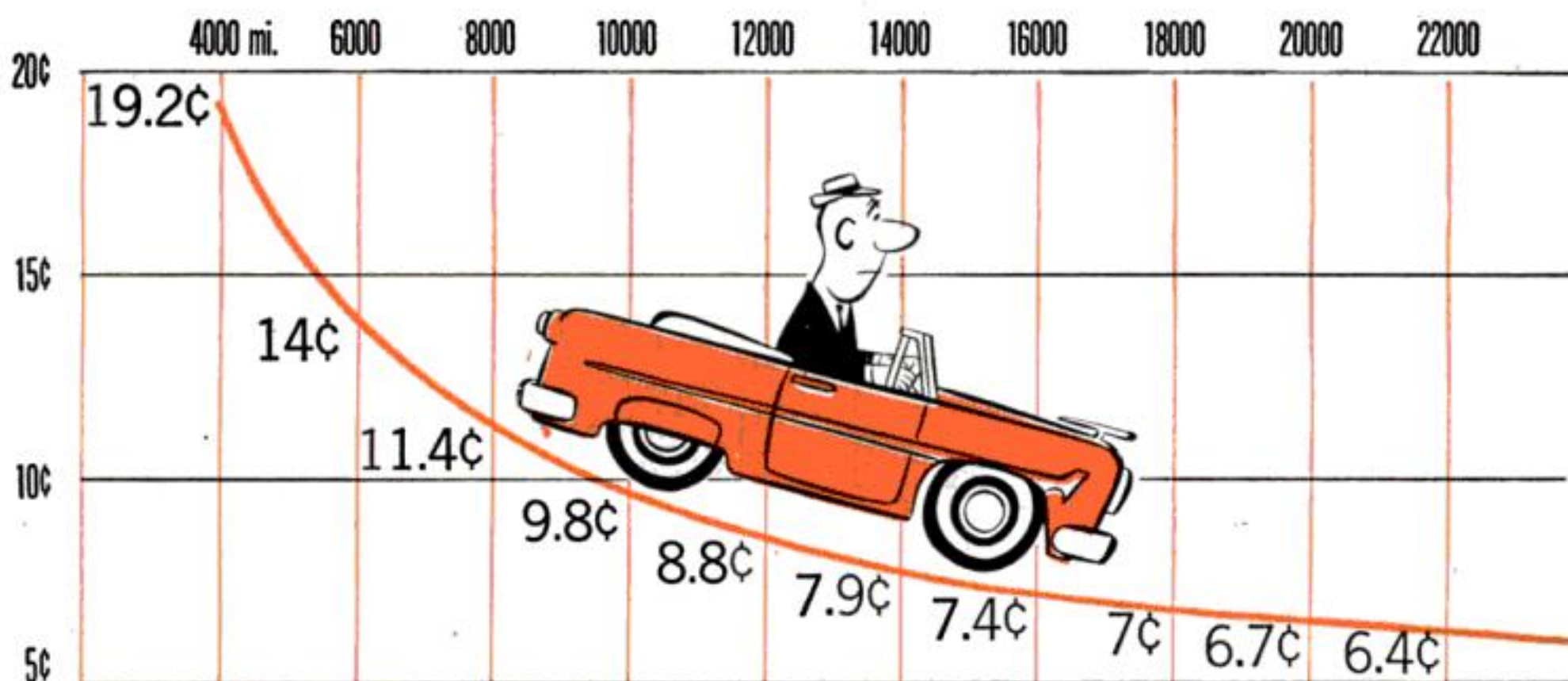
²Other sections under construction or planned include
Buffalo-Niagara Falls, Buffalo-Erie and links to
New England Thruway and New Jersey toll roads

³One 10¢ toll

^mCurbed grass areas

ⁿNortheastern Extension to open late 1956

Where information is not listed, it was not available
at press time



THE MORE YOU DRIVE the less you pay per mile—up to a point. At 10,000 miles a year, you're

beginning to get the best bargain. After 30,000 miles, the experts say, it's time to think about

REPORT TO MOTORISTS

What Does It Cost

The cents-per-mile depends not only on how much you drive but how you drive, where you live.

By Edward D. Fales Jr.

BACK in 1940, and before, it was common talk that driving cost three to six cents a mile. Many salesmen got a nickel a mile "expense money" for driving their cars.

But that was before the cost spiral. High-test gas was 24 cents and you could get a new car for \$1,000.

Today the same gas averages more than 30 cents, practically any car costs over \$2,000, insurance is up, and toll roads are appearing right and left. Speeds of 60-70 are routine on most new roads—and they burn up more gasoline and wear tires out faster.

So what's happening to *your* pocket-book?

Some interesting basic figures come from the AAA and two Chicago accounting houses: the Dartnell Corp. and Runzheimer & Co.

The Dartnell company says you're about right if you figure that it costs you \$8.95 a week (\$1.28 a day) when

you drive 100 miles a week on good, flat, uncrowded roads. That's 8.95 cents a mile. In big cities, or on poor roads, you pay 9½ cents a mile; in mountains nearly 10 cents.

But if you go 200 miles a week, you get your miles "wholesale" (8.7 cents in big cities; 8.2 cents in open country).

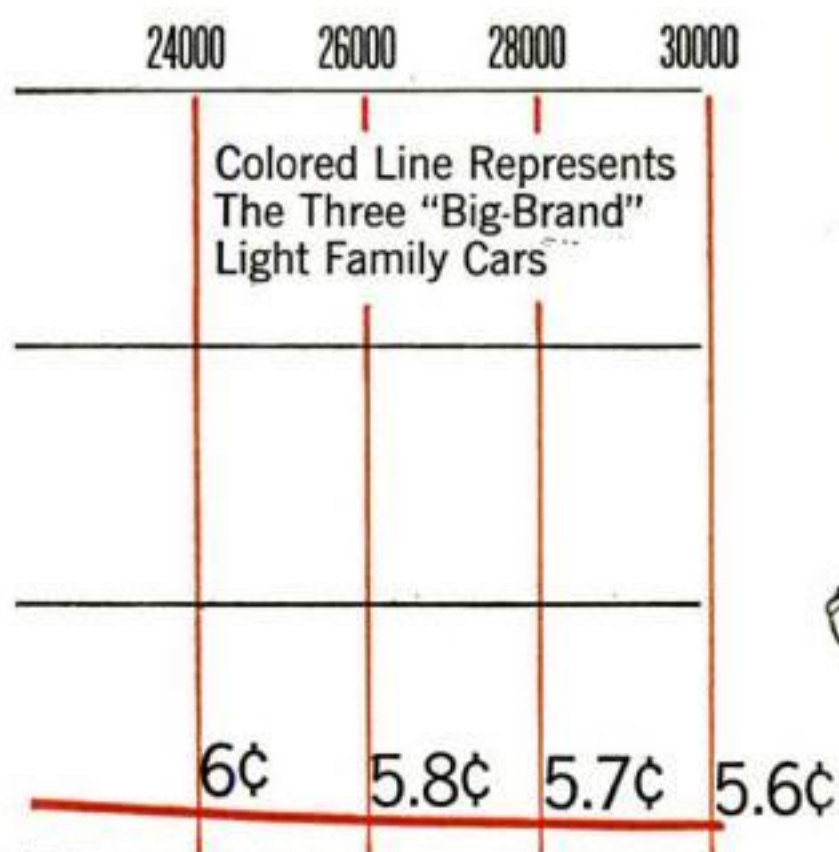
Runzheimer & Co. have a different kind of formula. It, too, is widely used by industry. You climb three easy steps to get your basic costs. (But remember that word *basic*. You'll see why.)

Runzheimer figures Mr. Average pays 9.8 cents a mile if he drives 10,000 miles a year. That's the figure for fairly new "low-priced" cars. It will vary a little for higher-priced or older cars. Here's how Runzheimer figures it:

STEP A: Daily variables. Let's assume you own a \$2,000 car that's not over two-and-a-half years old. You bought it new and you don't pull more than 18,000 miles a year through the speedometer.

So you jot down:

Gas and oil . . .	2.29¢ a mile
Maintenance74¢ " "
Tires51¢ " "
	<hr/>
	3.54¢ a mile



trading-in. And after 45,000 miles, the repair bills really begin to climb. If you're spending

\$10 per 1,000 miles for repairs, it's time to start thinking seriously of buying a new car.

You to Drive a Car?

Next, Runzheimer tackles:

STEP B: Fixed Costs. These are good U. S. averages:

Fire and theft insurance..	\$17.81
Prop. damage + liability	
(\$15,000 to \$30,000)...	86.65
Licenses	16.83
Depreciation	507.36
	<u>\$ 628.65</u>
	or \$1.72 a day

STEP C: Add them up.

If you're like a lot of families, the AAA says, you roll up 10,000 miles a year. With this good round figure it's easy to figure your basic average:

10,000 miles @ 3.54¢ . . .	\$354
365 days @ \$1.72	628
	<u>\$ 982</u>
	or 9.8¢ a mile

But suppose you drive only 5,000 miles, as a good many city people do:

5,000 miles @ 3.54¢ . . .	\$177
365 days @ \$1.72	628
	<u>\$ 805</u>
	or 16.1¢ a mile

If you're a traveling man and go 20,000 miles a year you've got a real bargain:

20,000 miles @ 3.54¢ . . .	\$708
365 days @ \$1.72	628
	<u>\$1,336</u>
	or 6.7¢ a mile

For accountants these are well-tested U. S. averages. They supply a firm working base when a company wants to study its travel costs.

But for you as an individual there's one trouble: your own costs may be quite a bit higher or lower depending on where you live and how you drive. Near Richmond, Va., you may get 16 miles per gallon on a new car; on mountain roads in Idaho you may get only 15. Near Richmond tires cost only .39 cents a mile; near Spokane, Wash., you chew them out at .68 cents a mile. Insurance near Spokane costs a lot more (as it does in Chicago and San Francisco, too). And car delivery costs run as much as \$200 less in some areas.

So, to bring the figures a shade closer to what driving a car probably costs you, Runzheimer has drawn up a "Where Do You Live?" table (next page). It lists local averages for different parts of the country, and you can use those figures instead of the national averages for both

'WHERE DO YOU LIVE?' TABLE

	Area "per-mile" cost (for use in Step A)	Area "fixed daily cost" (for use in Step B)
Portland, Ore.	3.65¢	\$1.73
San Francisco	3.55	1.96
Spokane	4.05	1.69
Sacramento	3.90	1.82
Boise	4.10	1.59
Tucson	3.90	1.70
Butte	4.00	1.48
Denver	3.85	1.74
Las Vegas	3.85	1.68
El Paso	3.70	1.59
Omaha	3.75	1.63
Dodge City	3.60	1.62
Corpus Christi	3.60	1.70
Duluth	3.45	1.79
Des Moines	3.15	1.67
Kansas City	3.25	1.75
Joplin	3.55	1.60
St. Louis	3.30	1.79
Tulsa	3.35	1.72
Ft. Smith	3.80	1.66
Houston	3.25	1.67
Jackson, Miss.	3.80	1.69
New Orleans	3.75	1.68
Chicago	3.25	1.72
Milwaukee	3.25	1.71
Louisville	3.50	1.64
Nashville	3.55	1.67
Birmingham	3.55	1.66
Traverse City	3.45	1.58
Youngstown	3.20	1.71
Syracuse	3.40	1.76
Elmira, N. Y.	3.20	1.73
Pittsburgh	3.45	1.69
Williamson, W. Va.	3.80	1.65
Chattanooga	3.85	1.73
Saratoga Springs	3.40	1.92
New York City	3.20	2.14
Chelsea, Mass.	3.25	1.93
Bayonne	3.20	1.81
Norfolk	3.35	1.60
Charleston, S. C.	3.35	1.66
Miami	3.45	1.76

daily variables and fixed costs in Steps A and B above. You get the figures for your area by finding the city nearest to where you live.

The averages, whether national or local, may not, however, include all your particular costs, especially for repairs.

The national maintenance figure of .74 cents a mile covers car washes, greasing, new plugs, oil-filter changes, carbon removal, brake relining, wheel and pump repacks, carburetor adjustment. But if you need a new generator or a battery, or dent a fender or pay for a rear-end job—that's extra.

How much insurance do you have? If more than a \$15,000 and \$30,000 policy, add your additional premium costs in Step B. (Don't forget your collision insurance, if you carry it.)

Do you get 30,000 miles on your tires? Accountants say that this is normal for new cars with five carefully rotated tires. But if you get only half that, as some drivers do, your tire cost is doubled. Change the .51 cents item in Step A to 1.02 cents a mile.

Do you drive fast? If your speedometer shows 60-70 more than it shows 45-55, add an extra .2 cents a mile for gas.

Do you drive with spurs on? Your personality may save—or cost—you money. If you are an exceptionally even driver, never use speed bursts and start slowly, deduct half a cent a mile. If you are first away at lights, load your engine on hills, make fast stops, add half a cent.

The cowboy who passes you with tires squealing is paying a penny extra per mile for being a hot-shot. **END**

New Rail Crossing Signs Spell Out Luminous Warnings

CAUTION signs coated with a sheeting that reflects a night-driving motorist's headlights as he approaches are now guarding many of the country's railroad grade crossings. The crossbuck blades of the stand at right, made by Kaiser Aluminum, are said to be not only safer but to have a longer life than signs made of steel or wood, since they will not rust, rot or warp.



New for Boatmen



1. Package to Boat in 60 Seconds.

Sturdy enough for an outboard, this three-seat boat folds into a 90-pound, 11-foot flat package that can be carried or strapped to the top of a car. For launching, the plastic-coated marine-plywood boat is opened up to its four-by-10-foot size, and the seats and a transom brace are put in place. The brace doubles as a mounting bracket for the motor.

2. Meter Measures Fishing Line. Here is a 3½-ounce plastic device for a rod and reel that gives you bait depth or casting distance by measuring the line



payed out as you troll or cast. Looped once around a capstan on the meter, the line brings into action a train of eight nylon-resin gears. A dial registers pay-out to 100 feet and then re-

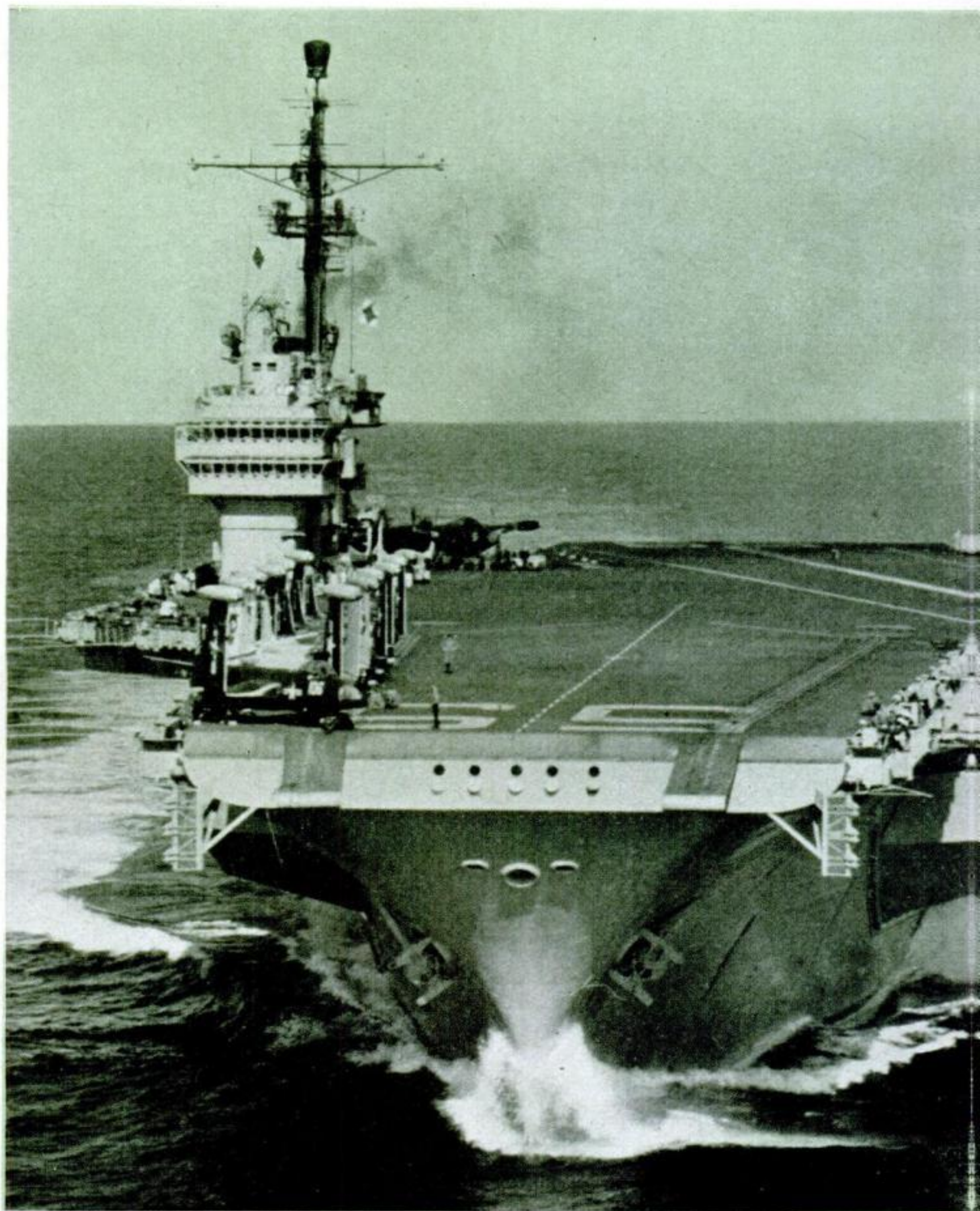
peats. It can be reset when lifted and rotated back to zero. The meter is also useful for sounding or measuring.



3. Make-'Em-Yourself Lures. A kit containing aluminum molds, jars of colored liquid plastic, hooks and stylus lets you make your own lures, from mayflies to the wiggly crayfish above. You heat the plastic in the molds to cast lifelike bait.

More information about the products described on this page can be obtained from: 1. Higgs Marine Service, 300 Zerega Ave., Bronx, N.Y.; 2. Production Lathe, Inc., P.O. Box 1085, Burlingame, Calif.; 3. Clinton Sales, Inc., Cleveland.

Forrestal's Steam Slingshots



Juggle Jets at



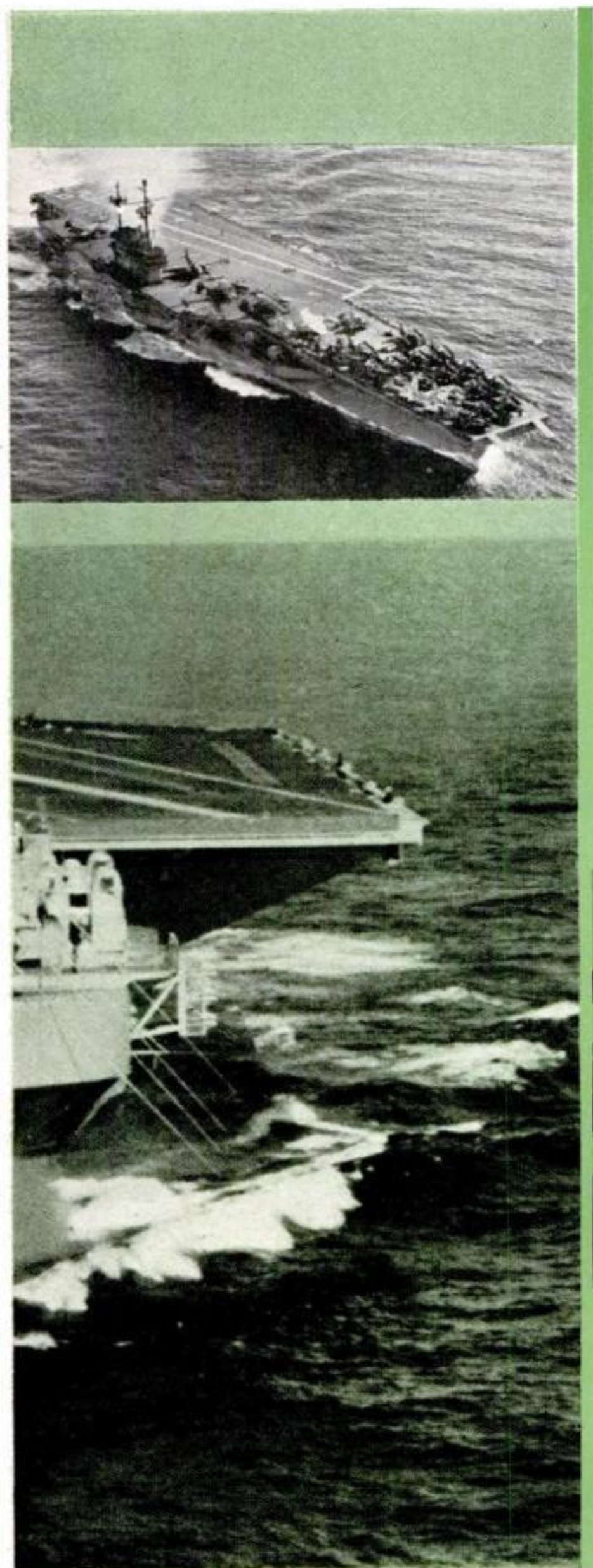
Record Speed

By W. W. Morris

WHEN a visitor is piped aboard the USS *Forrestal*, he is given a map of the place. That's so he won't get lost, because this mighty aircraft carrier is the world's whoppin'est warship on active duty.

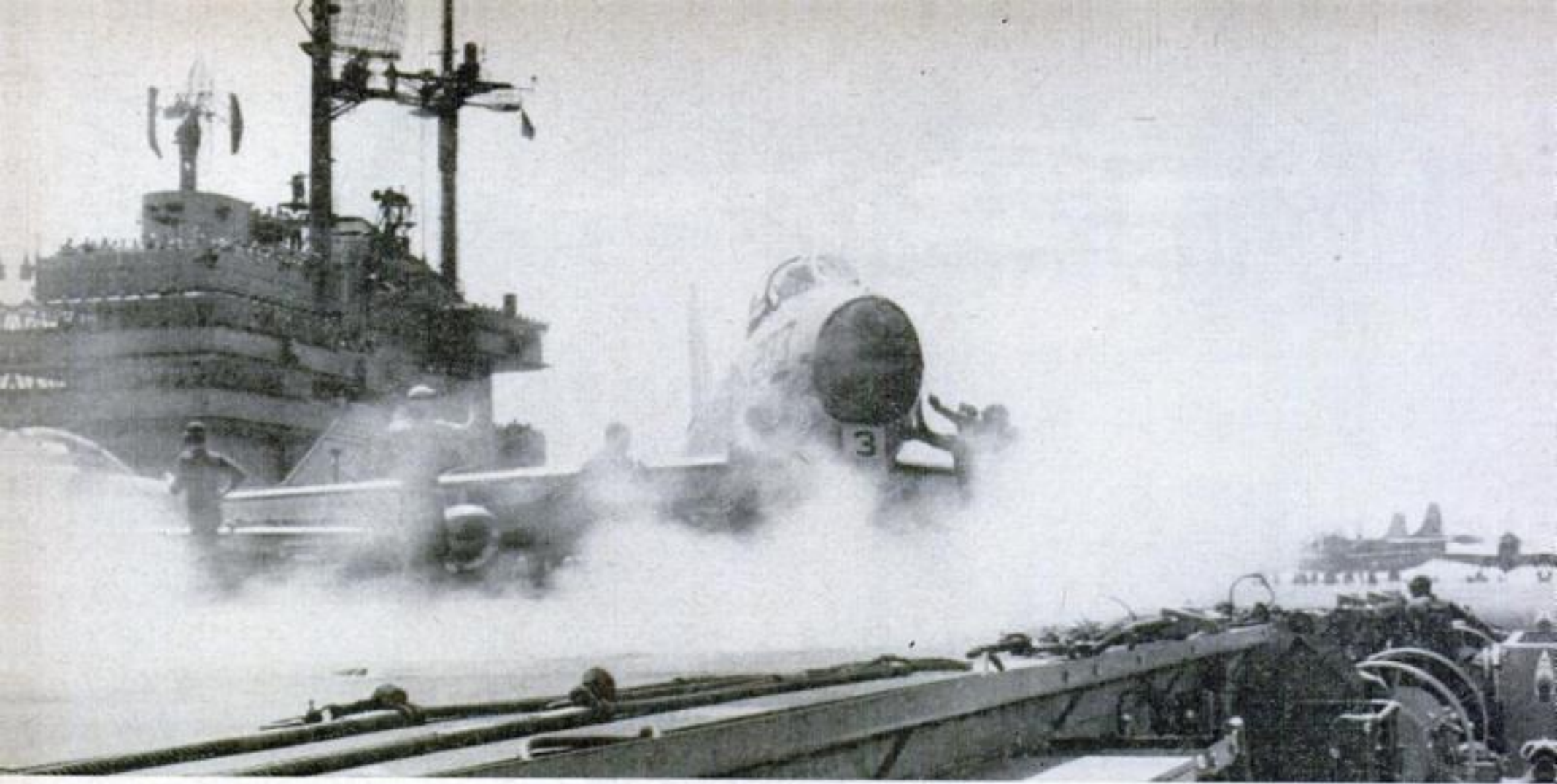
It boasts many firsts. It's the first American carrier with a "canted" deck, where incoming planes land cockeyed to the vessel's direction of travel. And it's the first American carrier to catapult its planes into the air by steam.

As a result, it juggles jets almost faster than you can blink. Its catapults can launch 32 planes in four minutes. The angled "runway" permits planes to be landed while others are being launched. With the old straight-down-the-deck system, it had to be either one operation or the other. Moreover, if a plane's tail

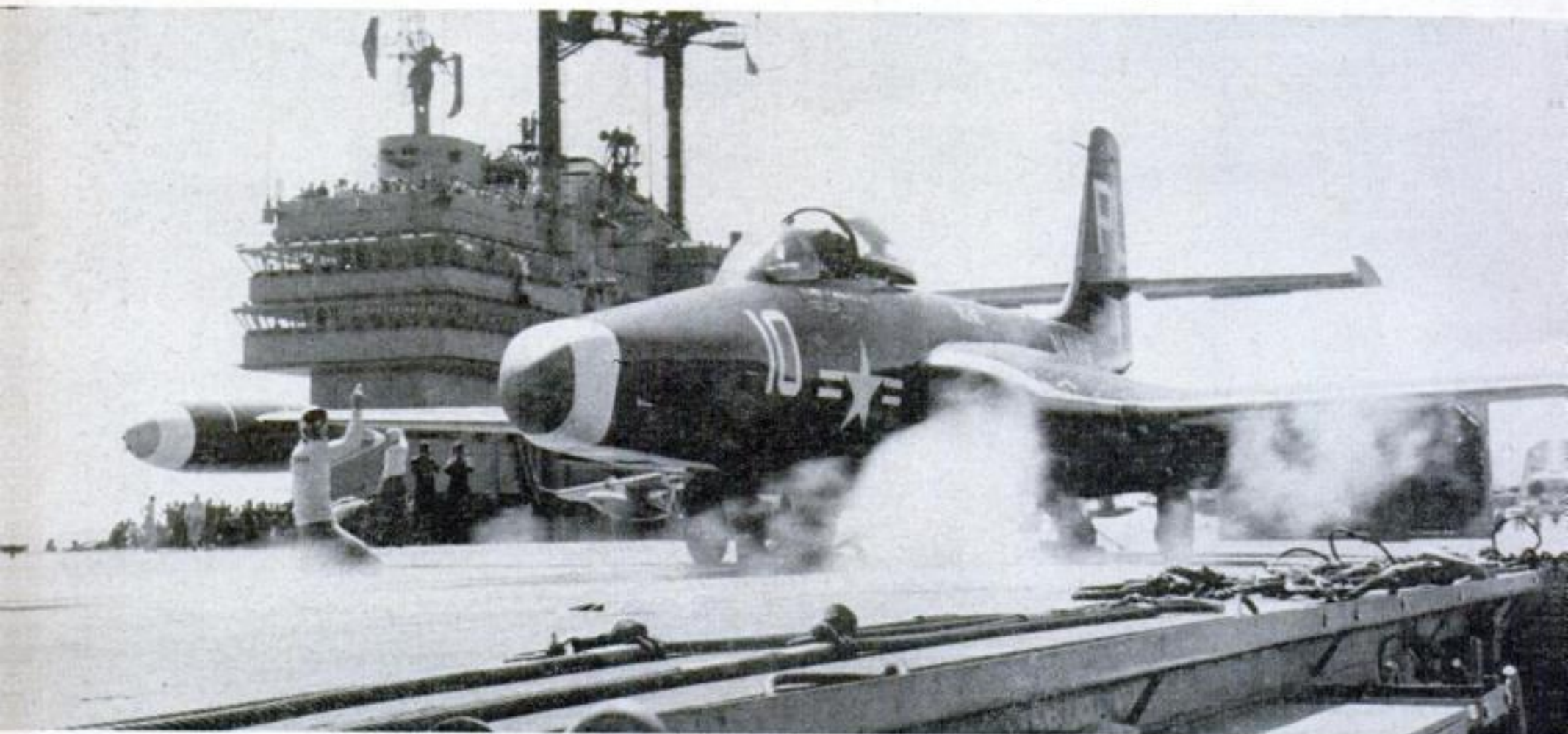


BOOTED ALOFT with a 20-mule kick by a steam catapult, one of USS *Forrestal*'s jets takes off from the "canted" runway. Hemispherical structures in the foreground are part of new-type gun mounts. The huge ship rolls very little in rough seas.

CLEAVING BLUE WATER, mighty *Forrestal* (left) exhibits big port overhang accommodating cross-wise landing strip. With turbines producing 200,000 horsepower, the ship can do over 30 knots. It's driven by two 4-blade and two 5-blade props.



Trundled into position on catapult, which can handle a 50-ton plane, jet is readied for takeoff.



Any moment now (above), then WHOOSH! (below) it's aloft. Two more will be off in 8 seconds.



hook failed to catch a deck arresting wire, the plane ran into a temporary barrier erected for just such an emergency. On the *Forrestal*, the pilot just guns the engine and comes in again.

That isn't all. If no planes are landing, both the forward lip of the canted runway and bow section of the 1,036-foot flight deck, can be used for catapulting.

The *Forrestal*—named for the late James V. Forrestal, first U.S. Secretary of Defense—displaces 70,000 tons loaded. (For more about this ship, see PSM, August '54, p. 128.)

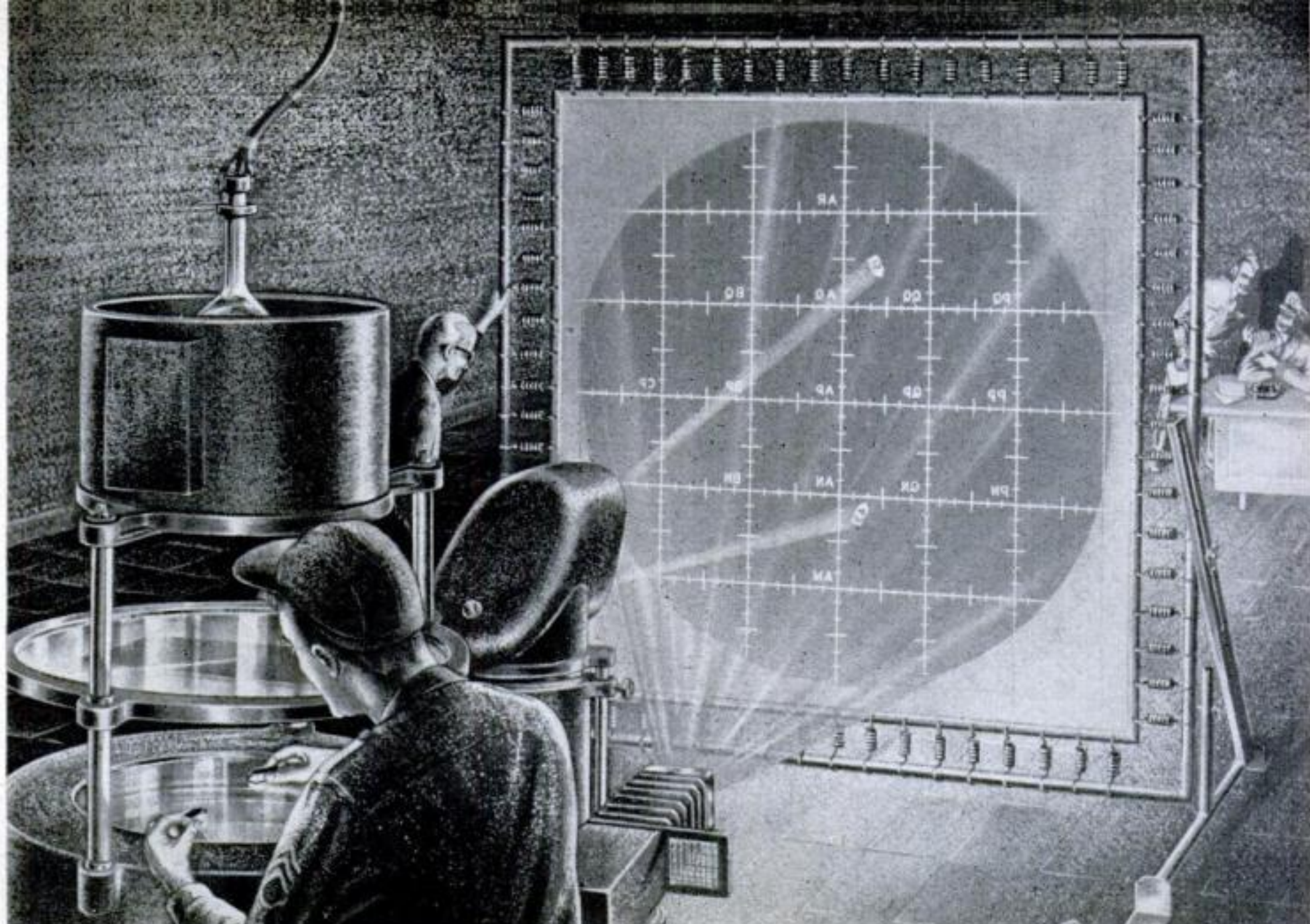
The new *Saratoga*—soon to go into service—will be even bigger and faster.



PLANE APPROACHES the canted landing strip from downwind to engage an arresting wire.



Four elevators, each as big as two suburban lots, take planes four decks down to hangar deck.



Radar Projector Puts Plane-Tracking Data on Big Screen Instantly

ANALYSIS of radar information for controlling and identifying airplanes will be speeded up by a new optical projection device that instantly transmits data on plane movements onto a viewing screen. This is how Sky Screen, perfected by

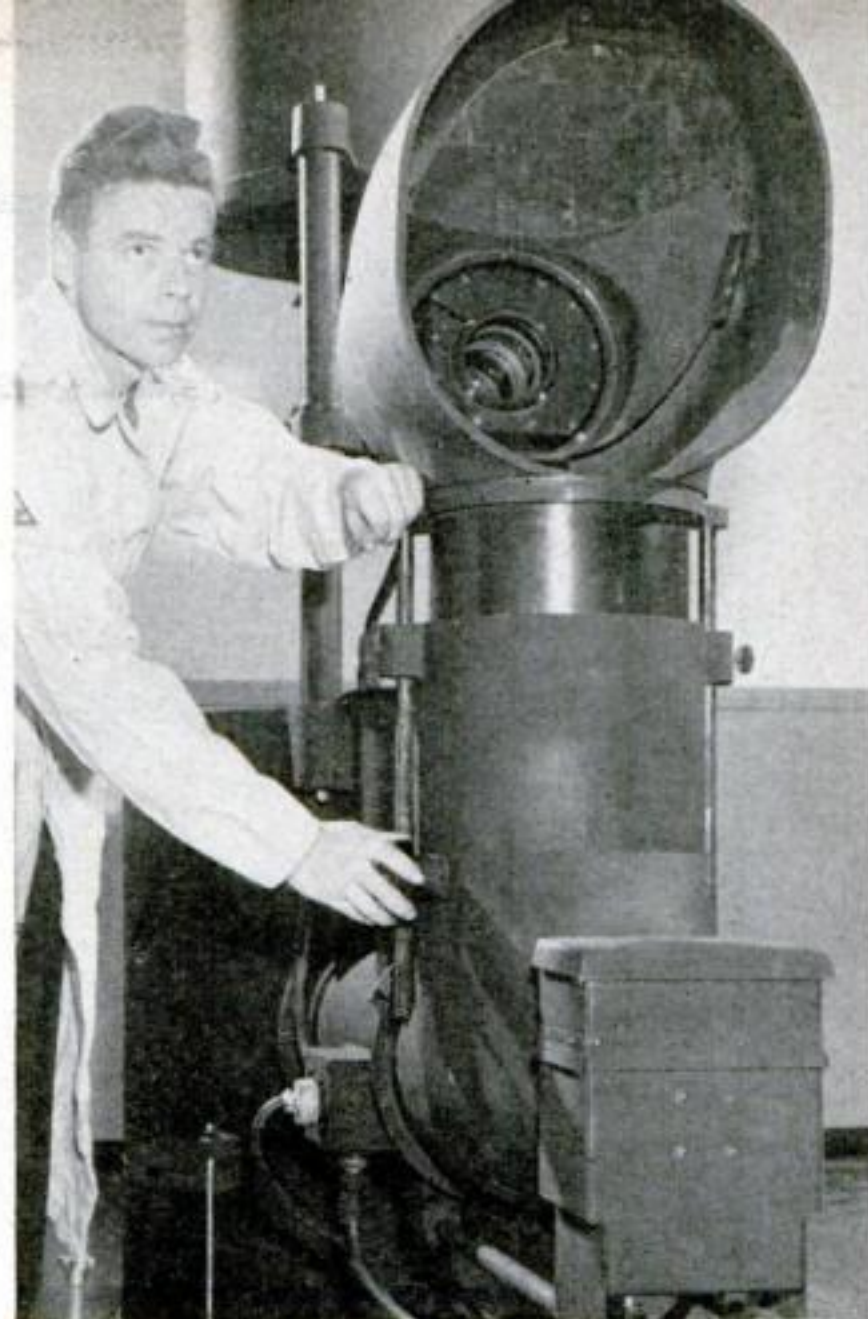
New Cargo Copter Lifts Bigger Load Than It Can Hold

HOVERING like some giant insect, this new cargo helicopter totes an 1,800-pound Volkswagen with ends out.

Seven-foot-wide doors on both sides and welded tubular construction make transporting of bulky cargo possible without use of slings.

The LZ-5 is a commercial version of an Army model also built by Doman Helicopters, Danbury, Conn.

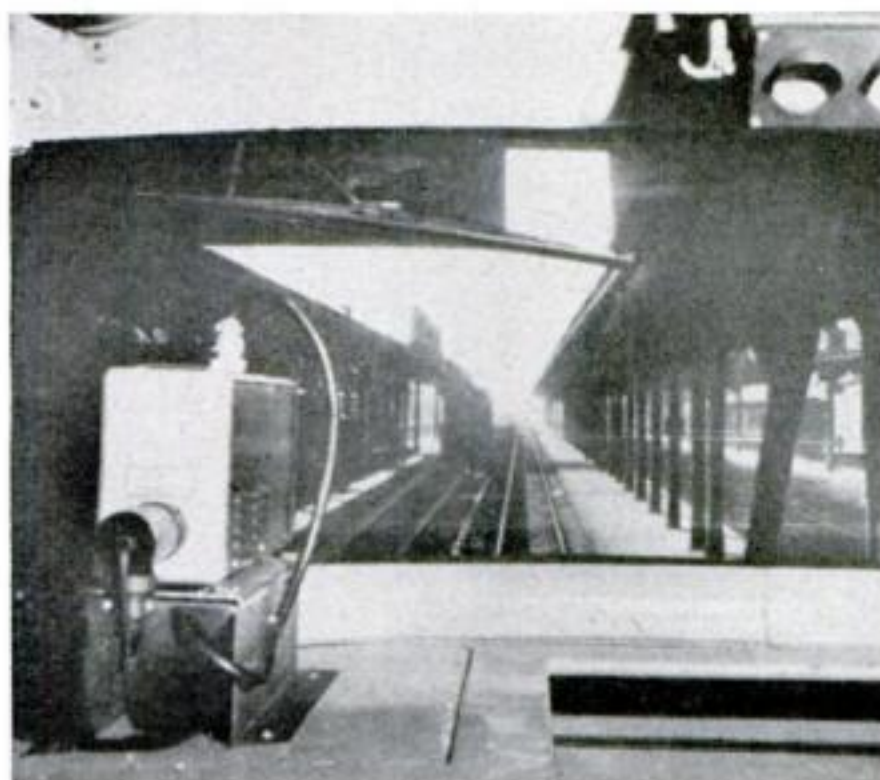




Northrop Aircraft, works: Pips from the radar tube at top are transferred via a beam-splitting mirror to a 16-inch plotting surface. Glass-chip markers with arrows and numbers are moved by an operator to coincide with target locations

and directions. These markings are projected by a system of reflectors and lenses through a periscope to the screen.

The periscope projection head, shown above, swivels 360 degrees so that the screen can be put anywhere in the room.



TV Camera in Locomotive Shows Passengers What's Ahead

PASSENGERS on the Rock Island's *Jet Rocket* between Chicago and Peoria, Ill., get the same view in the lounge car that the engineer has from his cab. It's a

railroad application of closed-circuit television. The camera, set up in the locomotive at left, flashes scenes of the road ahead to a lounge-car receiver.

The Lumberyard

Need any snakewood, teak, ebony or dao? Constantine's has it, as customers from Christmas Island to Iceland have found out.

By David R. Lindsay

WHEN the FBI was trying a while back to track down a fugitive who was known to be a skillful amateur cabinetmaker, the agents enlisted the aid of a unique lumberyard, Albert Constantine & Son, Inc. of New York City. Sure enough, in the lumber company's records of mail-order sales they found their man's latest address.

Like former Secretary of State Dean Acheson, TV's Dave Garroway, and many other celebrities and just plain home craftsmen from Iceland to South America and the far Pacific to England and Iraq, the FBI's fugitive had turned for wood to a place that stocks more kinds than most woodworkers can name.

On the racks at Constantine's, which this year is celebrating its 144th birthday by breaking in a new building, you won't find a stick of fir or pine. But you'll find sweet-smelling planks and veneers of Honduras mahogany, Burma teak, American curly maple, Brazilian rosewood, English oak, Indian padouk (a striking, almost scarlet wood), French walnut, Gaboon ebony, lignum vitae (the hardest wood known, so dense it won't float), snake-wood, cocobolo, lemonwood, bubinga, and some 100 or so others dear to the cabinetmaker's heart.

Orders from South Pacific. Almost every time a ship leaves Christmas Island for the U.S.A. it carries an order from a craftsman there for American cherry or black walnut and some lacquers and stains. Two monks in Chile recently ordered a few hundred square feet of veneer from Constantine's, and shortly afterward a man telephoned from Alaska

Prefabricated inlaid borders are sold by the yard; a few contain more than 50 different pieces of wood to the inch.

Cabinet woods are stocked in 306 pre-cut sizes, dressed four sides. Wood and plywood racks are open to customer inspection. Large blocks for carving and turning are also carried for woodwork enthusiasts.



Known 'Round the World

to have some ebony air-expressed so that he could get a wedding present finished on time.

Usually, Constantine's doesn't hear what happens to the wood and veneer that it ships, but in a few cases it has found out. A Mr. Bates, who buys oak and birch, is better known by the name Peg Leg. A professional dancer who appears on TV and has only one leg, he carves his own wooden legs from the lumber he selects. A famous neurologist, Dr. Hubert S. Howe, used to buy small pieces of birch. He made batons. One of them, which he had given Maestro Arturo Toscanini was auctioned off at the Metropolitan Opera House for \$10,000. A Mr. Fred Stark of California, who has been ordering wood in small quantities for some time, turned out to be the musical director for Walt Disney. He makes miniature organs that really play.

Mail orders are 90 percent of the company's business. An old-fashioned, 126-page catalogue with feature articles, color plates of the wood, inlaid borders, and inlaid pictures, and black-and-white photos lists the items carried. A good part of the business is in wood-finishing supplies, cabinet hardware, and special tools. The head of the firm, Albert Constantine Jr., is proud of having 137,000 active customers scattered all over the free world, including several hundred not so free—they're prisoners in state penitentiaries.

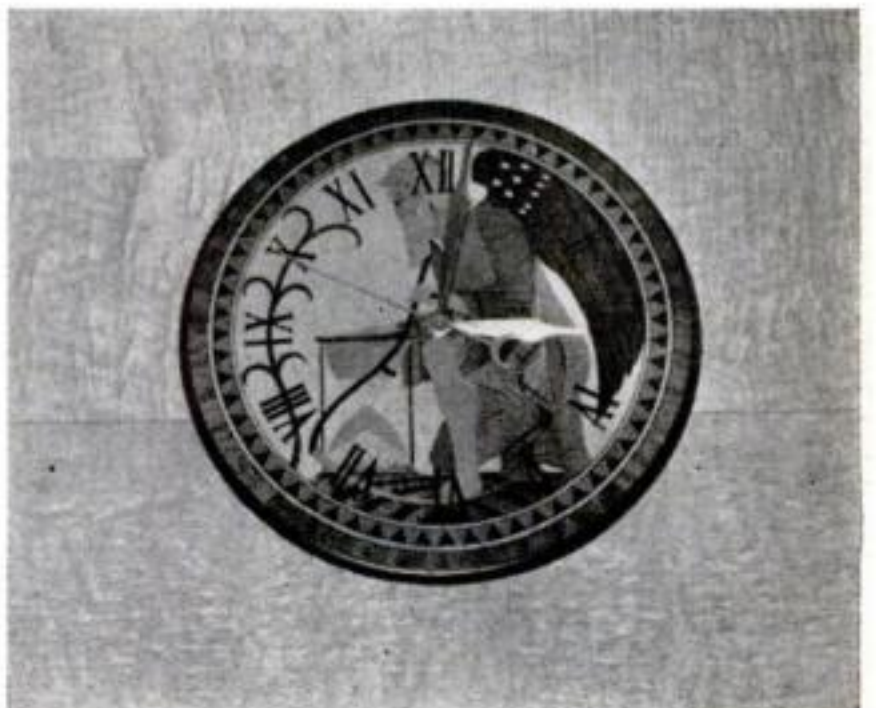
The other side of the law buys, too. An assistant D.A. once attended one of the company's free courses for craftsmen. In the middle of a lecture the sound of sirens was heard and a policeman rushed in. The assistant D.A. hurried out to work on a water-front murder case.

Many of the 500,000 annual orders and letters the firm receives contain questions on how to perform woodwork-



Veneers are sold by the square foot, come in untrimmed sheets that are 1/28-inch thick.

This inlaid clock is built into paneled curly maple walls of showroom.





Pre-cut inlays, some nearly a foot wide, are on display; inlaid wood faces for checkerboards are also stocked.

ing or finishing tasks. The man on Christmas Island wrote that he was having finishing trouble because of the high humidity. Mr. Constantine sent him some retarder to slow down the drying of lacquer. Even commercial customers ask for advice. Not long ago, a representative of the international division of General Electric telephoned for help in deciding how to finish

walnut; Constantine's had just shipped 50,000 feet of it to Uruguay for GE to be used in radio cabinets.

Samples of wood are often mailed in, too, for identification, duplication or finishing advice. One morning when John Docherty, vice-president of Constantine's, came to work he found a car and trailer parked in front of the door. In the trailer, it turned out, the driver had some wood too big to mail in—a piano. He had driven in to find out how to finish the wood.

An international Wood Collectors' Society member, Mr. Constantine says there are roughly 25,000 different types of trees in the world not counting the subspecies.

In keeping with its special status in the lumber business, this woodworker's gold mine has unusual offices. The sales and showroom has samples of 126 hard woods and several inlaid pictures hanging along one wall. A large wall clock has an elaborately inlaid face. The walls are paneled in curly maple taken from the same tree which supplied panel-

Besides tool display, showroom walls have photos showing the cutting of tropical woods and several large, elaborate inlaid wood pictures.



ing for part of the White House when it was recently rebuilt and redecorated. All the offices have wood-paneled walls. The head of the firm has a fieldstone fireplace in which he has a fire going almost all winter—not of birch or oak or other local wood, but of scraps of ebony, rosewood, mahogany, and even occasionally satinwood. The smoke from satinwood will kill a canary and put people who breathe it into a sound sleep.

Customers are free to wander into the storage section of the plant—all the wood is kept indoors in the building, which covers a little more than one-fifth of an acre. Among the racks are some power saws but most of the cutting and planing of wood is done at the storage and importing yards the wood comes from. The lumber on hand is free of knots and checks and is cut square to standard dimensions and dressed on all sides. The veneers are stored in bundles, usually in sheets 1/28-inch thick, often showing the contours of the logs they came from. Instead of being sold by the board foot, like wood for building and general carpentry, lumber is sold by the square foot, with price depending on thickness and rarity. A lot of it runs quite high—often as much as several dollars a square foot.

One of the oldest businesses in New York City, Constantine's was founded in 1812 by the great-grandfather of today's owner. At that time it was a log storage and inspection yard on Wall Street. As the city grew it moved uptown.*

Early in the 20th century the father of the present Mr. Constantine started importing wood and veneers. But the business of supplying amateur woodworkers grew quite by accident. Originally all customers were commercial (Constantine's still supplies Steinway and other piano companies; Sloane's, the Fifth Avenue furniture company; Spalding's tennis racket department; and other firms making folding doors, banjos, match-stick blinds, etc.).

When the depression hit, the market for imported wood and veneer did more than dwindle; it disappeared, leaving Constantine's stuck with more than 20 million feet of imported veneer and lumber. Occasionally during the good years, a passer-by had wandered in to buy a board or piece of veneer for a home workshop project. Though it was strictly a wholesale business (it once sold a single lot of logs that filled 35 freight cars), it used to oblige these



Daughter Dorothy, her husband John Docherty and son with Mrs. and Mr. Constantine around the piano; both couples work in the plant. Below, Albert Constantine stands before a portrait of the firm's founder, John Constantine.



*Now at 2050 Eastchester Rd., New York 61, N.Y.



Talking Mailbox...



...Its Voice



Talking Vendor

Post Office Goes Electronic

To SPEED up service and keep it courteous, the Post Office is trying out two electronic-age devices on its patrons.

The talking mailbox at top is in front of the Grand Central Annex station in New York. A regulation mailbox in other respects, it houses the diaphragm of a two-way communications system. An inquiry clerk at the other end answers questions concerning Post Office service. At left is a stamp dispenser in Detroit. A tape recording in it says "Thank you."

They Say Now...

FRANCIS B. PORZEL, ARMOUR RESEARCH FOUNDATION: "A hydrogen bomb shock wave racing across Chicago at 1,000 miles per hour would destroy property values at the rate of a billion dollars a second."

DR. ALAN T. WATERMAN, DIRECTOR, NATIONAL SCIENCE FOUNDATION: "The people who established this country . . . were men and women of endurance and tough moral fiber . . . Now the frontiers are those of the mind. Are we to shrink from equipping our children . . . to meet the challenges of a technological age?"

DR. JAMES R. KILLIAN JR., PRESIDENT, MASSACHUSETTS INSTITUTE OF TECHNOLOGY: "The most acute shortage we now face is a shortage of high intellectual talent adequately educated and in the right place."

ARTHUR C. STUDDT, HOTPOINT CORP.: "You cannot make chemicals, gasoline and electricity by hand. Advanced techniques make such difficult products possible."

JOHN E. MCKEEN, PRESIDENT, CHAS. PFIZER & CO.: "Antibiotics . . . have not only saved lives . . . but have helped to sustain them by enabling the farmer to grow more food more quickly."

New Ideas from the Inventors

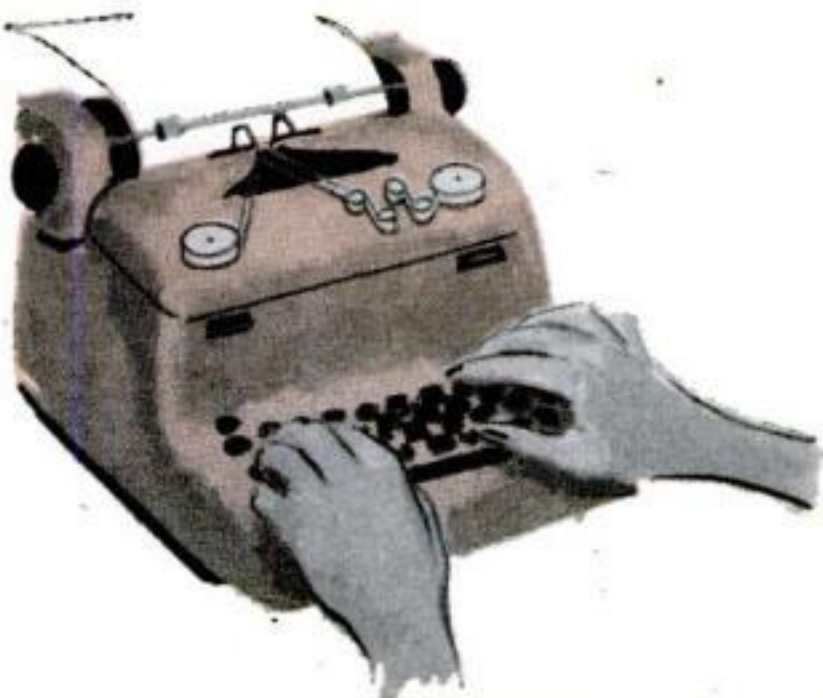


1 Side Keels to Reduce Draft. Two outrigger keels, says this inventor, could replace the usual deep, heavily ballasted one and thus let you sail lightly

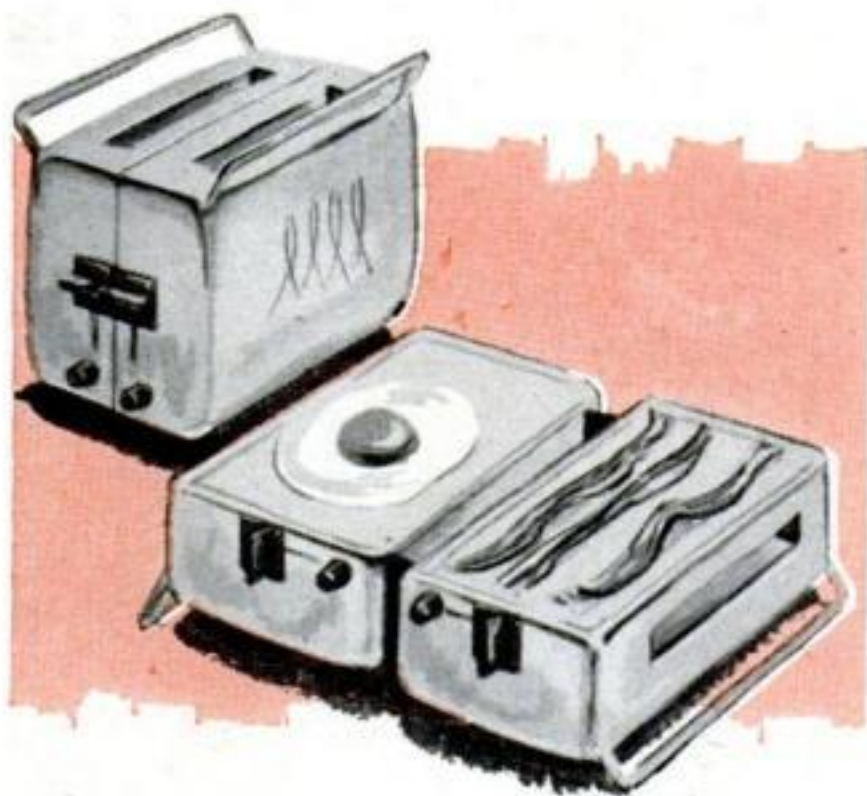
constructed, shallow-draft boats. The side keels would be angled so that one of the pair would cut the water vertically whenever the boat heeled over.

2 Pad to Re-Ink Ribbon. A typewriter ribbon would last longer—and make clean, uniform impressions—if it were reinked by this attachment. As the ribbon snaked around four rollers, one would apply ink, the others would absorb the excess to prevent splatter or blur.

3 Webbed Frame to Pad Dash. For cars that don't have built-in crash panels, this attachment—consisting of a bolted-on frame and a stretched-fabric impact absorber—might prove a lifesaving accessory. The unit would fold down for access to the glove compartment.



More New Ideas from the Inventors



4 Toaster to Double as Grill. Split down the middle and hinged as shown, this pop-up toaster would serve as a handy grill. The heating elements of the grill would warm the hot plates. The open-out design would also simplify the job of removing bread crumbs.



5 Barrow Sides to Fold Flat. With the sides of this wheelbarrow dropped, flat loads could be toted and balanced more easily. Lowering the headboard alone would permit loads to be dumped at a lower angle. The whole unit would fold for compact, upright storage.

7 Drive-In Canopy to Shield Car. These retractable canopies would be mounted on loudspeaker posts in drive-in theaters. The driver on each side of the post

could extend a canopy from its housing to cover his car. It would keep vision-blurring rain off the windshield and let you keep the car windows open.





6 Tray to Keep Small Parts Clean. The tiniest parts and fittings would be kept safe—and clearly visible—on this tray. The housing would hold accessories in its wells and conceal paper for the bottom which would be renewed by pulling it through a slot as shown.

8 Cycle to Ride Two Wheels or Four. Mounted on a motorcycle, scooter, or bike, these auxiliary side wheels would fold up, either forward or back, during normal two-wheel operation. They could be let down to give a two-wheeler needed balance in stop-and-go traffic, or extra traction on wet or icy roads.



9 Phone Signal to Sound an Alarm. Thermostats or trip mechanisms, according to this patent, could be hooked into existing phone circuits to bypass regular phone switches. If fire or forced entry closed an alarm switch, a signal would be automatically telephoned to a central station and operators could dispatch help to the scene immediately.

U.S. patents on these inventions have been granted to: 1. M. Hill, Westport, Conn.; 2. G. Hernandez G., Mexico City; 3. J. Rumsey, Lawrence, Kans.; 4. W. Taylor, Arlington, Va.; 5. R. Ensminger, Berkeley, Calif.; 6. A. Barrett, Sioux City, Iowa; 7. L. Bermejo, Meadowbrook, W. Va.; 8. L. Paldanius, Port Huron, Mich.; 9. R. Huntington, Jr., and J. Williams, Oroville, Calif.



Three-wheeler's passenger compartment has a well for feet. Wood frame is hardboard-paneled.

This Station Wagon Is

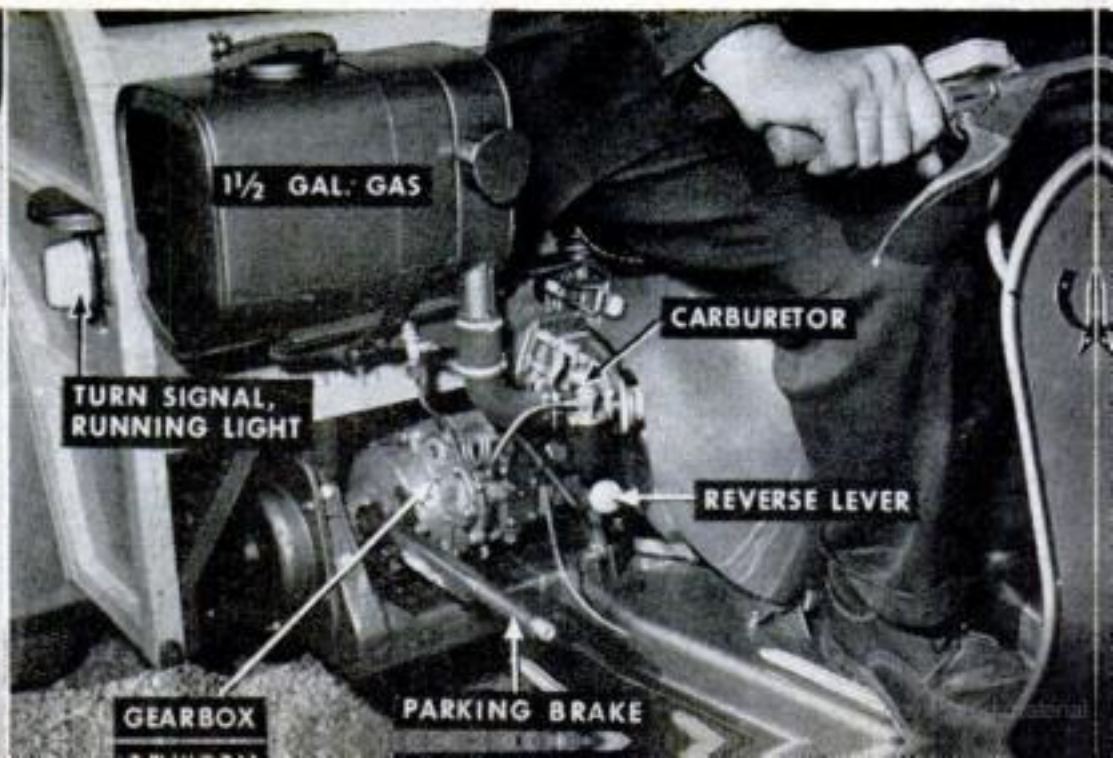
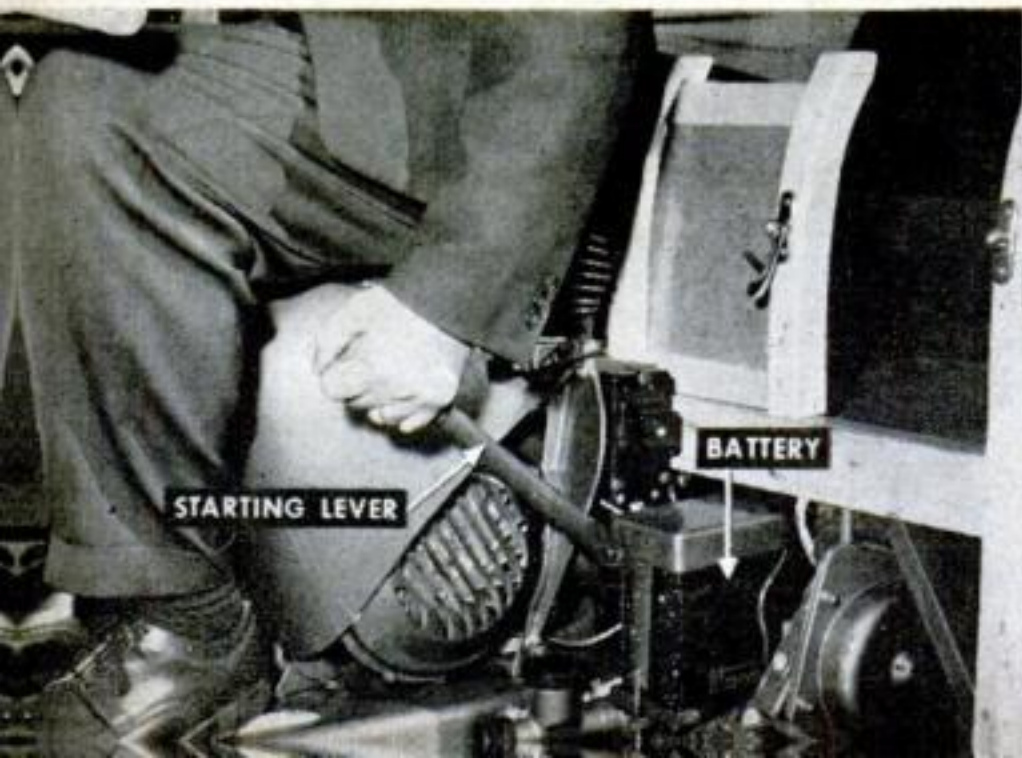
A FELLOW in Italy has designed something new in station wagons: a one-cylinder scooter with a sort of caboose, which is the station wagon.

The wagon part of the machine totes

two grownups or up to four kids. Two of these scooters can be parked on a nickel meter. The vehicle goes about 35 m.p.h. and over 90 miles on a gallon of gas. Called the Vespa (Wasp), the new

PULL-UP LEVER starts one-lung, two-cycle engine. In Vespa's wagon version—company makes a number of types of scooter utility vehicles—motorist's seat is above engine.

FUEL TANK, at right of seat, holds one and a half gallons plus a half-pint of oil per gallon for lubrication, like an outboard motor. The tank also contains an air cleaner.





It has a hood for protection from rain . . .



. . . Can be ridden to the train . . .



. . . For the small fry it's really a lark . . .

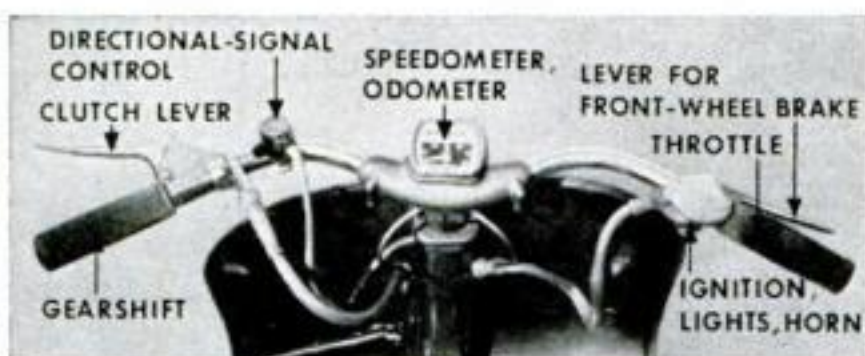


. . . And the thing is surely a cinch to park!

a Scooter

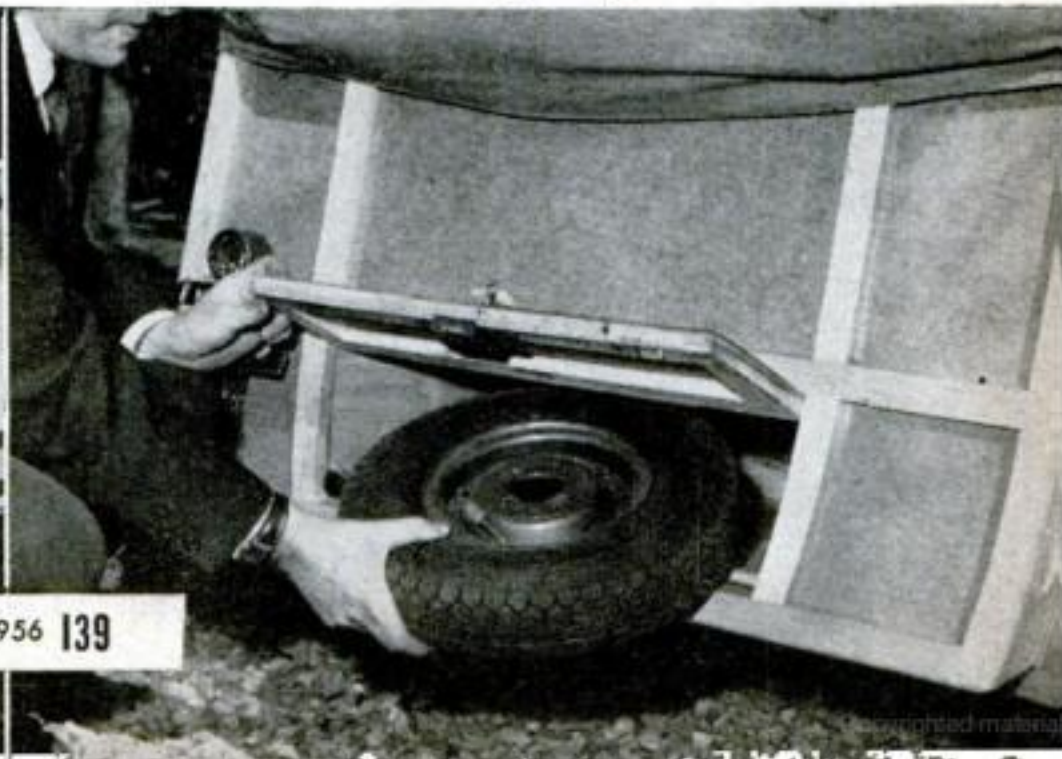
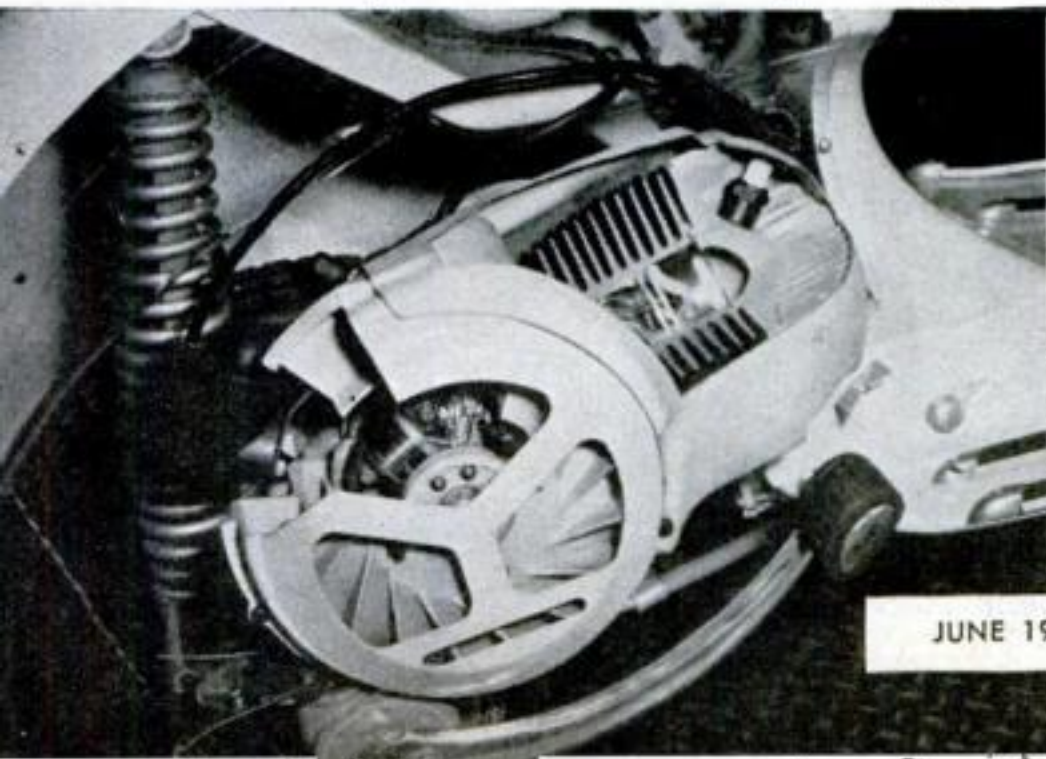
wagon sells in the U.S. for \$996. It's a product of Enrico Piaggio of Genoa, the man who has been largely responsible for putting all Europe on three wheels in the last 10 years.

IMPELLER FAN, shown here in cutaway on two-wheeled Vespa, cools the engine, which develops six horsepower. Ignition is by magneto. Station wagon also has a battery for lights.



HAND CONTROLS require 19 separate movements to get into fourth gear from a full stop.

SPARE WHEEL is toted much as in all station wagons. Vehicle license in states charging on weight basis is \$5 to \$10. Wheelbase is 65 inches, width 50 inches, length 82 inches.



New Aids to Living



1 Two-wheel pushcart totes such loads as wet wash, garbage cans and heavy garden sprayers. Riding on broad, rubber-tired wheels, the light cart is easily managed by a single-grip handle of aluminum tubing.

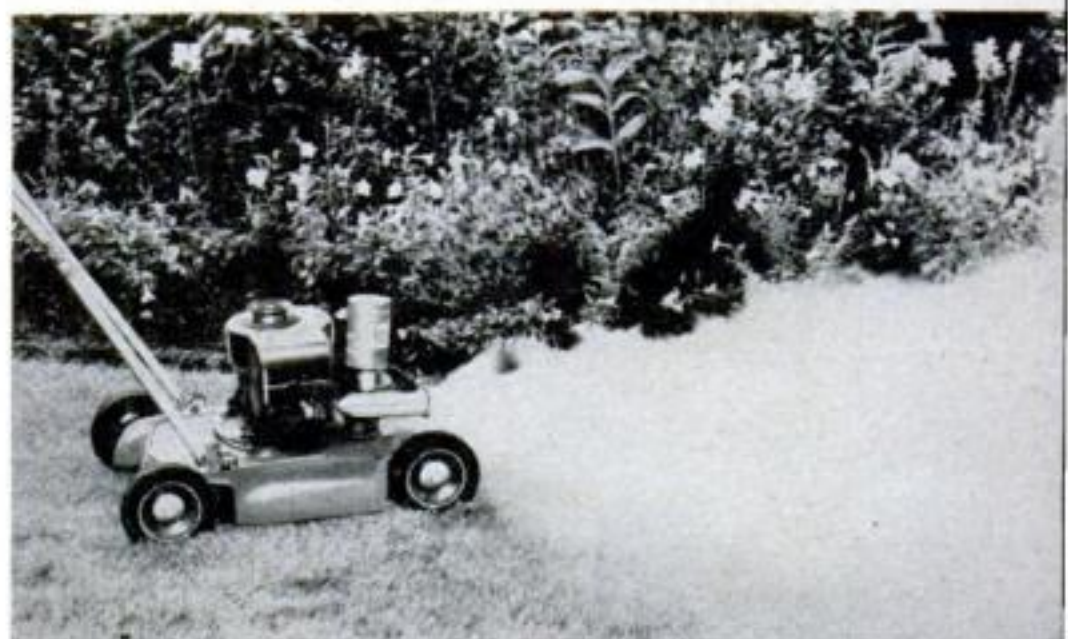


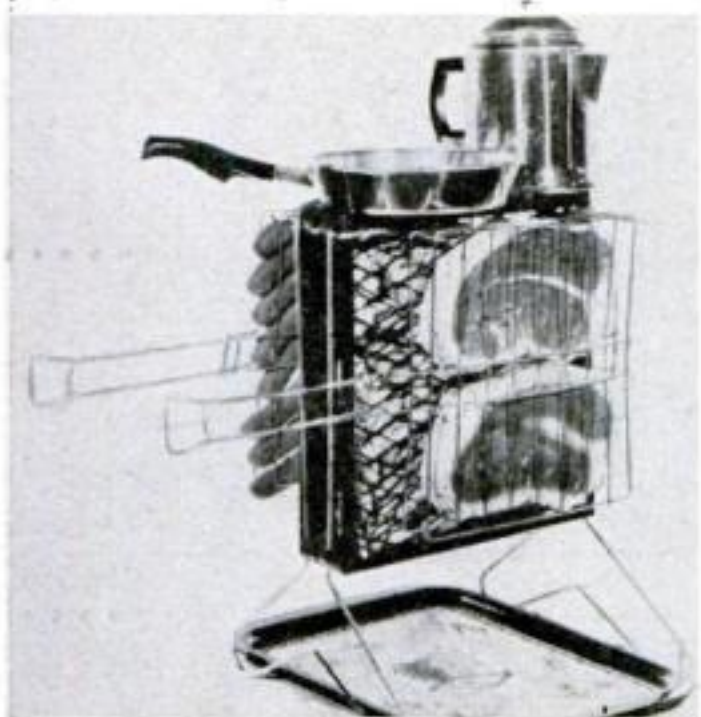
2 Outdoor lift, for hillside homes and vacation cottages built on steep slopes, rides on steel rails that are available for various distances and grades. You can seat two or more in the car, which is pulled up and lowered by a cable-winding drum machine operated by an electric motor. It has safety devices like those on elevators.

3 Traveling-case radio, in top-grain cowhide styled for outdoor or indoor use, operates three ways: AC, DC or battery. With its built-in antenna, say the makers, you can bring in stations even in difficult-reception areas. Civil Defense broadcast frequencies are marked.



4 Power-mower sprayer rids the average back yard of mosquitoes, gnats and other insects in 10 minutes, according to the manufacturer. The attachment can be installed on most power mowers. It fogs through a muffler, which also acts to quiet the exhaust when you cut grass.





5 Stand-up broiler, with two pounds of charcoal inside, can broil four steaks, 40 hot dogs or 18 hamburgers at once, and also cook on its top. You can lay it on pull-out side legs for use as a camp stove.



6 Toaster warmer keeps hot breads hot at the table. Sliding prongs fit into the corners of the toaster slots and are adjustable for most pop-up electric toasters. The tray is made of perforated steel.



7 Adhesive applicator that resembles a ball-point pen dispenses dots of rubber cement when you press down on its point. The capacity of the barrel is about 5,000 dots. Refill cartridges are available.



8 Non-choking dog collar is made with a spring-steel bulge at the front to fit over a pet's windpipe so that pressure is applied only to the muscles at the side of its neck. A running ring at the back of the collar compensates for size adjustments and keeps the leash in a direct line with the U-shaped insert.



9 Light intensifier clips on an electric bulb and directs a concentrated beam where you want it for reading, doing close work or assembling small parts. It consists of a specially designed lens in a metal casing fitted with spring clips that clamp firmly on the end or side of a standard household lamp.

More information about the products shown on these pages can be obtained from: 1. Hoke Tool Works, Raeford, N.C.; 2. Sedgwick Machine Works, 153 W. 15th St., New York City 11; 3. Zenith Radio Corp., 6001 W. Dickens Ave., Chicago 39; 4. Donaldson Co., 680 Pelham Blvd., St. Paul 4, Minn.; 5. Lakewood Mfg. Co., 25039 Center Ridge Rd., Westlake, Ohio; 6. Trude Mfg. Co., 3821 S. Racine Ave., Chicago 9; 7. Poppet Corp., 8707 Hudson Blvd., North Bergen, N.J.; 8. William C. Driscoll, 16 Lotus Rd., New Rochelle, N.Y.; 9. Frances Murray, R.R. 3, Bloomington, Ill.

*"Here, gentlemen, is the secret. Why
make the mechanics rich?"*

.....

Gus Bait

By Martin Bunn

"I WANT to give my car a pill," said the seedy little man, adjusting his pince-nez glasses and fixing Gus with a glittering, if watery, eye. "Be so good as to let me have a pint of gasoline to wash it down with."

Gus took in the customer and his small '49 car at one glance. One was as pompous as the other was ordinary.

"I don't know much about giving pills," he said easily. "What are they for?"

"They improve the gasoline mileage by 200 percent." He showed Gus a bottle containing small red pills. On the outside was printed "GAS-O-MORE—ADDS MILES TO YOUR MILEAGE."

"Take my advice, mister, and don't use them," Gus told him. "If you aren't getting good mileage, you probably need a tune-up."

The man took off his glasses and let them hang by the long black ribbon around his neck. "I figured you'd say something like that. You mechanics are all the same. Want to get your hands on a man's car. Expensive tune-ups. Not me. I do all my own work. I'll put you fellows out of business one of these days."

Gus couldn't help being amused. "How?"

The little man returned the pills carefully to a suitcase on the front seat. Then he handed Gus a business card which read: "Philo Dittington, Mr. Do-It-Yourself, Author, Lecturer."

"Why, sure!" Gus exclaimed. "You're going to talk at the Business and Pro-



*"Mr. Do-It-Yourself is a fake
—and he'll prove it."*

a Trap

fessional Men's Luncheon Club this noon." He extended his hand. "Let me be the first to welcome you to our town."

Mr. Dittington put a small, paper-bound book into Gus's outstretched hand. "This is my book on servicing your own car. It's called: *Be Your Own Mechanic*. Only a dollar. Might give you some pointers."

Gus laughed. "I'll wait until after the lecture to do my homework. I'll see you this noon." Philo Dittington got into his car and stepped on the starter. The engine ground over and over with a tired whine before finally catching.

"Wouldn't be surprised if your car needed a little attention," Gus said. "Maybe the plugs or points."

"I know," retorted Dittington. "It's the points. I happen to have a new set in the glove compartment. But you're not going to get the job. Right after my lecture, the president of your club is going to put them in for me."

"Fred Pettigrew?" Gus exclaimed. "He's a dentist. What he knows about engines wouldn't fill the reverse side of a postage stamp. I take care of all the work on his car."

PHILO DITTINGTON smiled smugly. "Don't worry, my good man. Each of my lectures ends with just such a demonstration. With the aid of my principles of self-help, Dr. Pettigrew will successfully install a set of points in my car. Come and see for yourself."

"The points in the car now," Gus inquired. "Did you put them in yourself?"

"No, sir. Just bought this car. Second-



hand. No sense in buying new cars when with my book I can fix anything that goes wrong. Good day, sir."

GUS arrived at the Community House at a quarter of twelve. Most of the membership of the Business and Professional Men's Luncheon Club was on hand. And already word had gotten around that their president, Fred Pettigrew, was going to install a new set of points in the speaker's car.

Jack Bishop took Gus aside. "Is this guy nuts?" he demanded. "Imagine letting Fred Pettigrew get under the hood of a car! Shouldn't we warn Dittington?"

Gus stroked his chin thoughtfully. "I'm more inclined to think we ought to warn Fred. I have a hunch that this Mr. Philo Dittington is an outright fake."

Bishop stared. "How come?"

"Just suppose Fred does succeed in installing those points, don't you suppose that most of the people here will buy a copy of Dittington's book? And that this Dittington will tell the whole town that the club's endorsed him? He's carrying some pills that are supposed to extend gas mileage. I figure he'll try to sell those at a fancy price, too. They're strictly n.g."

"Shouldn't we blow the whistle on him?" Bishop said indignantly. "I'm going to speak to Fred right now."

Gus held out a restraining hand. "Not now. It wouldn't do any good. I have no proof of any kind. We have to let the guy expose himself. Otherwise he'll say I'm persecuting him just because I'm scared that he'll hurt my garage business."

"But how can we get him to expose himself?"

Gus chuckled. "My hunch is that he's already set his own trap. I'll bait it, and I think we can watch him spring it him-

self. Just don't be surprised at anything I say or do in the next hour or so." He winked at Jack and moved off to the dining room.

WHEN the meal was over, Fred Pettigrew gave Philo Dittington a splendid introduction, which he read from a sheet of paper that Dittington had been thoughtful enough to supply. Dittington then arose and launched into a smooth, flowery dissertation on the merits of Do-It-Yourself as exemplified in the Ten

Dittington Commandments of Self-Help. There was something reminiscent to Gus of the pitch of the old-time snake-oil salesmen. Dittington laced his talk with references to his handbook.

"Here, gentlemen," he told them dramatically, "is the

secret of Do-It-Yourself. Why make the mechanics rich?"

Just to show them how simple it all was, he went on, he had prevailed upon Dr. Pettigrew, a distinguished member of the dental profession, to give them all a demonstration. When the applause had died down and the meeting was about to move outside, Gus got to his feet.

"Can I have your attention for a moment?" The room quieted down. "I want you all to know that the Model Garage stands behind this demonstration 100 percent."

Cries of "Good for you, Gus!" and "You're a real sport, Gus!"

Gus continued, "You all know I make a living servicing other people's cars. Just the same, I think the more people know about how to take care of their own cars, the better. If Mr. Dittington's book does what he says it does, you will all be better off for buying it. If it doesn't, you can get your money back at the Model Garage."

Again there was applause, and the



[Continued on page 220]



***This solid, roomy
barbecue table
lets you eat
outdoors in
comfort. Like
to make it?
Turn the page***

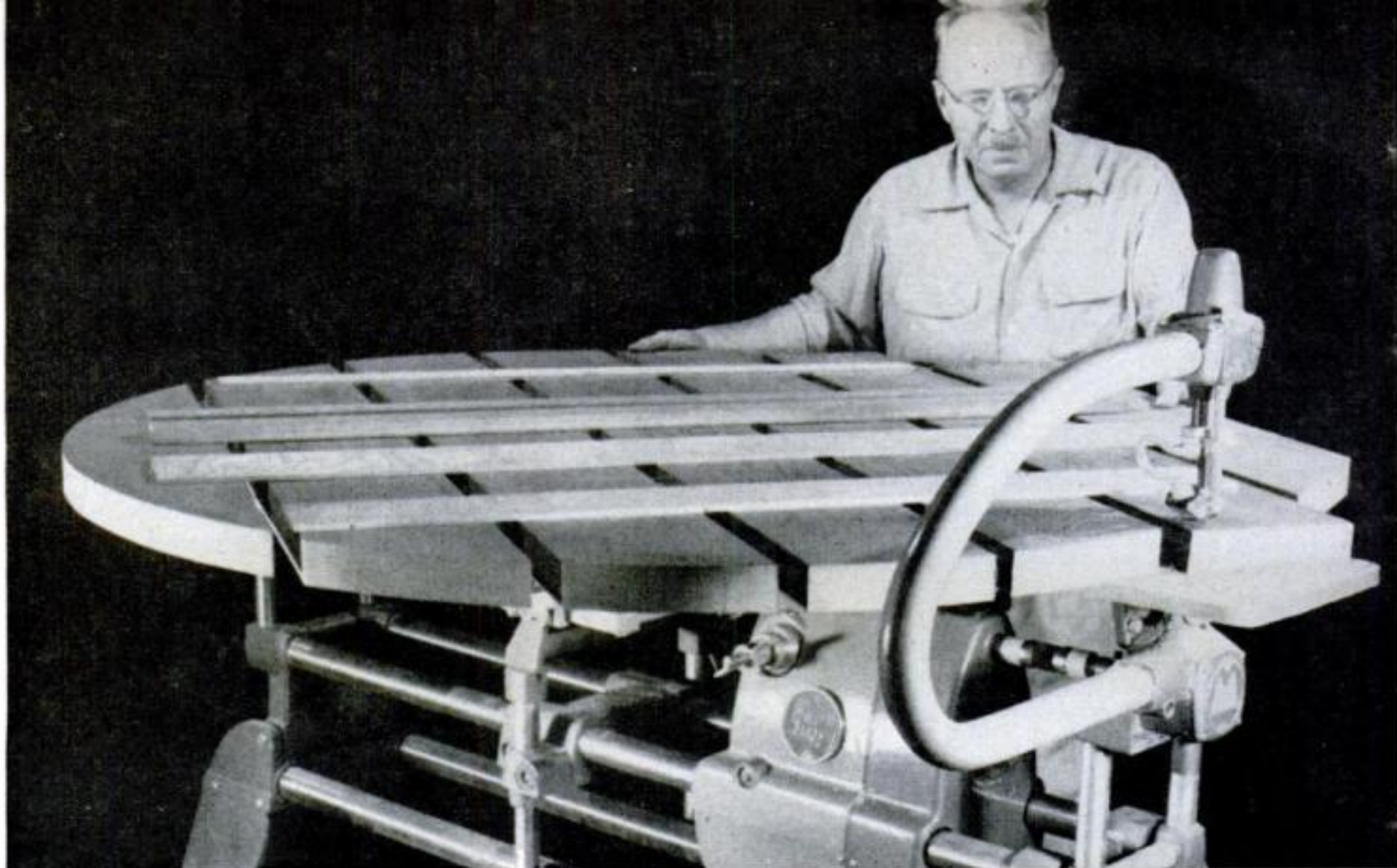


How to Build Your Own Garden Furniture

By Paul Corey and Darrell Huff



***Here's a patio
chair designed
for lazy cat naps
in the sun. Add
wheels and
arms if you like***



SAW OUT CIRCULAR TABLE after nailing pieces together with temporary cleats. If you're working alone, draw 56" circle with temporary cleats in place and cut each board out. Reassemble with permanent two-by-two cleats.

Patio Table Seats Eight

BARBECUES and back-yard picnics call for lots of seating capacity—the smell of charcoal broiling draws friends from all directions. This roomy table provides comfortable places for eight, and by squeezing in a few chairs between the built-in seats, 12 people can sit down.

Pine, fir or redwood are suitable for making the table. Dimensions have been worked out to fit standard board lengths, and you will barely have enough material left to make toothpicks for your guests. Hand-pick your boards for good, clear grain. Here's what you need:

Three two-by-eights; two 8' long and one 14' long, for the table top.

One two-by-twelve 14' long for seats.

One two-by-six 14' long for the legs.

Two two-by-fours 14' long for seat supports.

Two two-by-twos 12' long for cleats.

Thirty-two carriage bolts, $\frac{3}{8}$ " by 6", with washers.

Eight screen-door braces 42" long.

Eighty-eight flathead galvanized wood screws, 2 $\frac{1}{2}$ "-12.

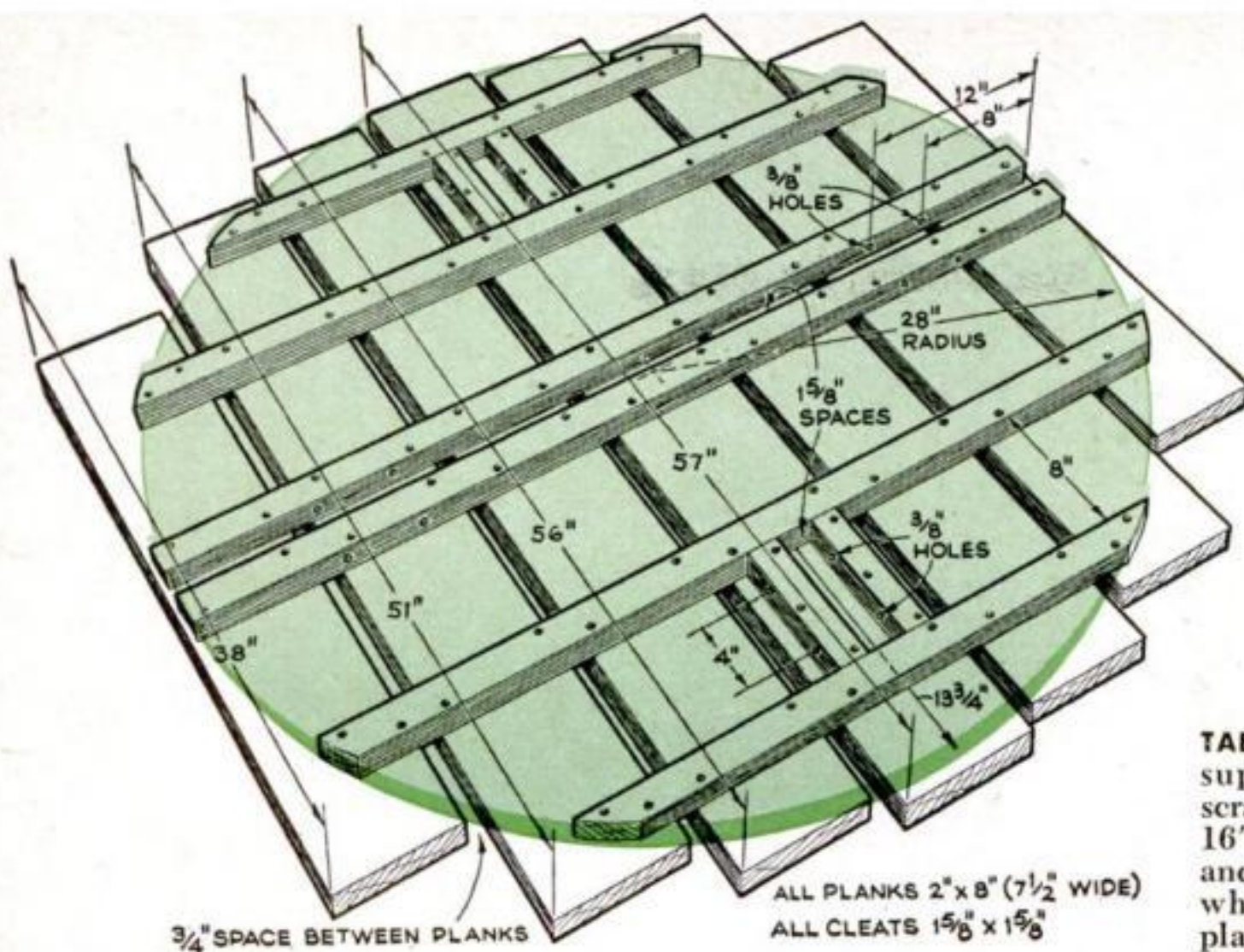
Lay out all cuts on the two-by-eight

boards and check them before cutting to see that you'll get all the pieces you need. From each of the 8' lengths, cut one 56" piece and one 38" piece. From the 14' length, cut two 51" pieces and one 57".

Spacing the boards. Arrange the pieces on the floor so that the outer edges of the two short pieces are 57" apart. Then fill in the remaining five pieces so that they are evenly spaced. There should be a $\frac{3}{4}$ " space between each piece, but if your lumber has shrunk below the standard 7 $\frac{1}{2}$ " width, compensate for it so that you'll get a full 56"-diameter table.

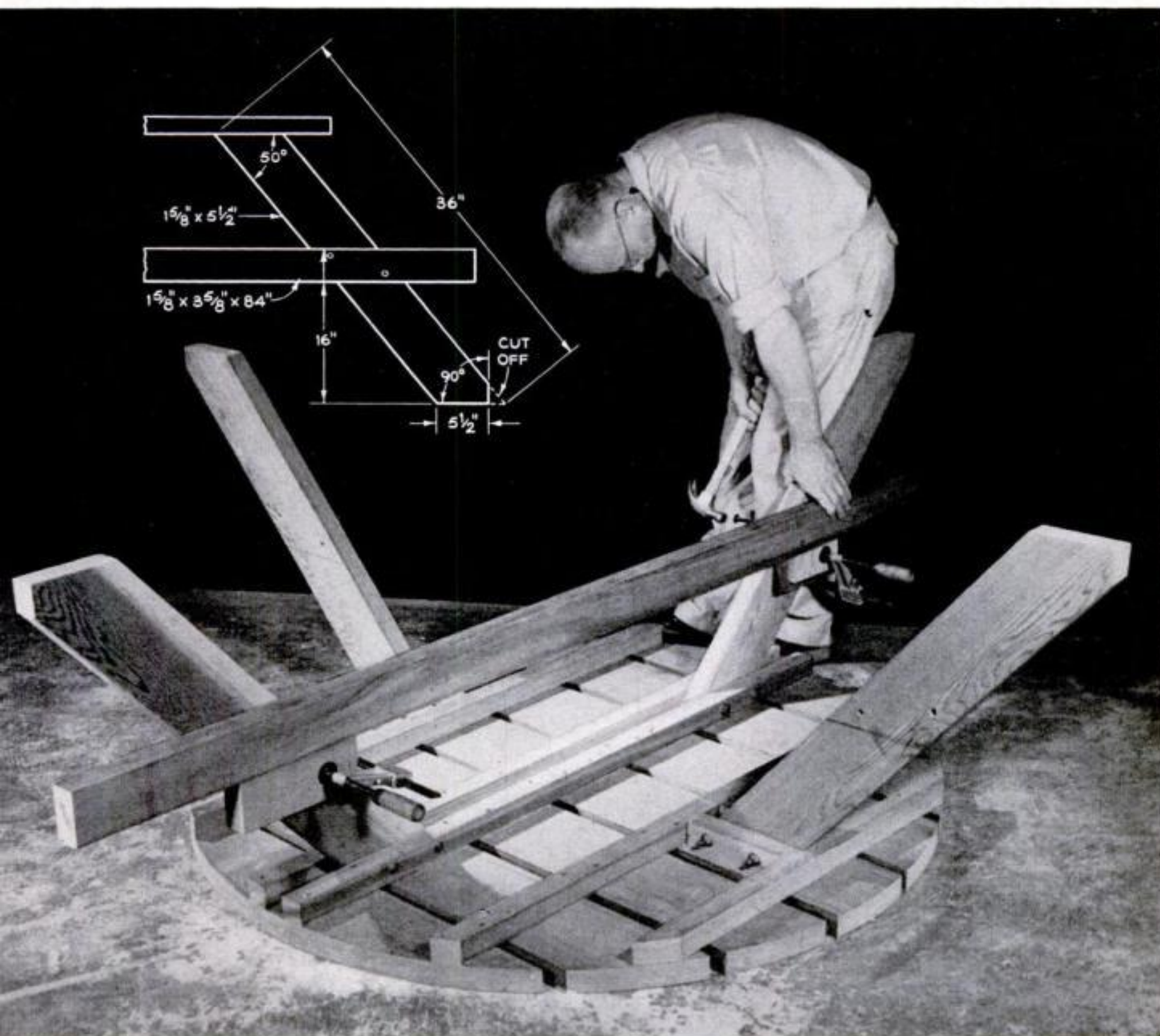
Nail temporary cleats across the pieces and draw a 28" radius from the center of the center piece. Saw out the circle and smooth the edge with a plane or rasp.

Cut the two-by-two into cleats to fit across the boards and fasten them in place with waterproof glue and screws. Cut four 8" cleats and fasten them to the center piece as shown. Bore $\frac{3}{8}$ " holes 8" and 12" from the ends of the two center cleats before fastening them in place. Bore holes in the 8" cleats 2" from each end. Space these cleats 1 $\frac{3}{4}$ " apart



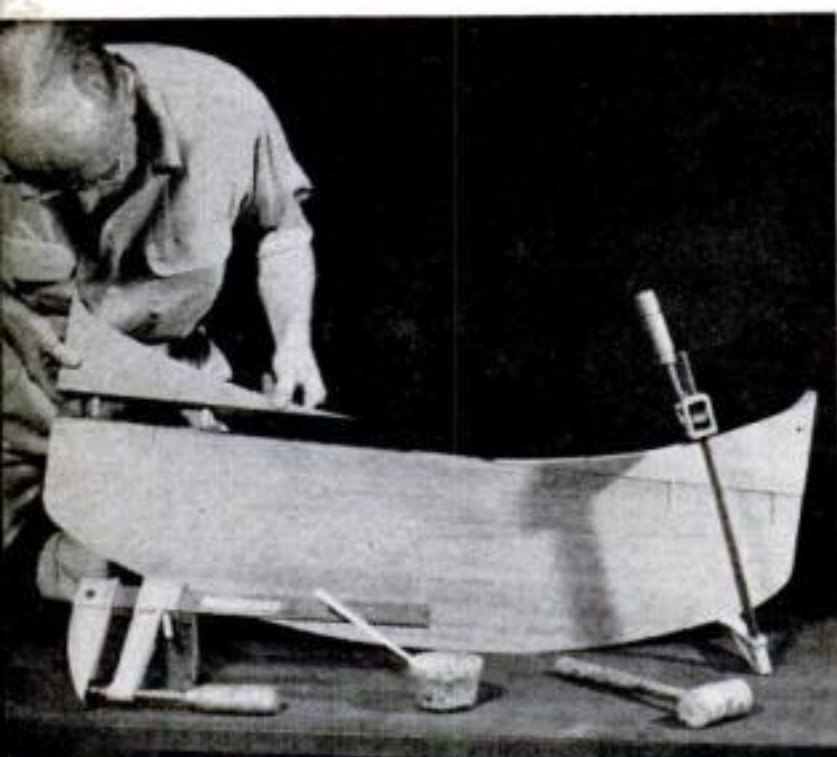
ARRANGE PIECES on flat surface after cutting to specified lengths. Spacing between boards should be about $\frac{3}{4}$ ", but depends on actual width of boards. Glue and screw cleats in place after cutting.

TABLE CROSS BRACES also support the seats. Clamp scrap blocks on a line drawn 16" from bottoms of legs and rest braces on them while fastening them in place. Note how the outer tip of each leg is cut 90°.

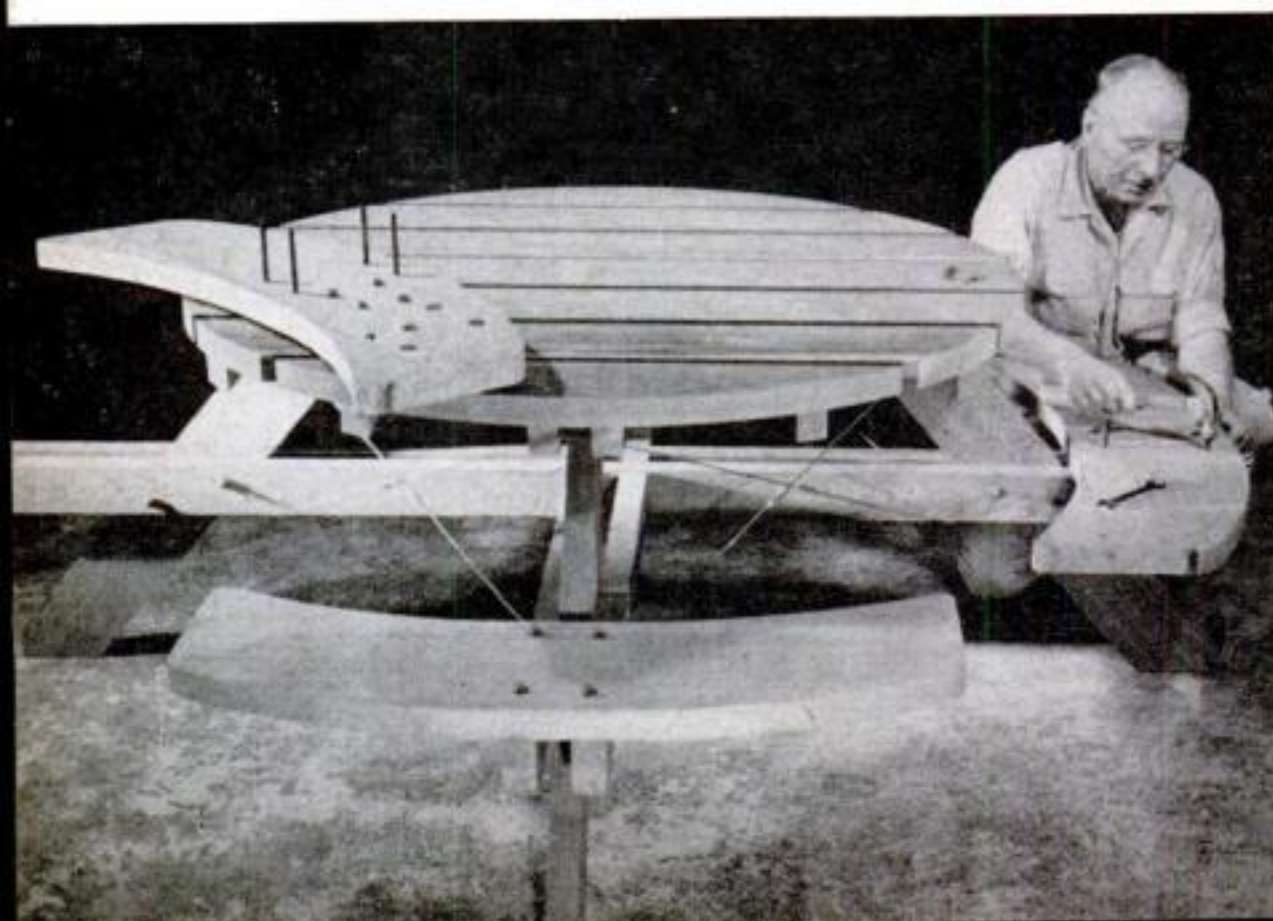
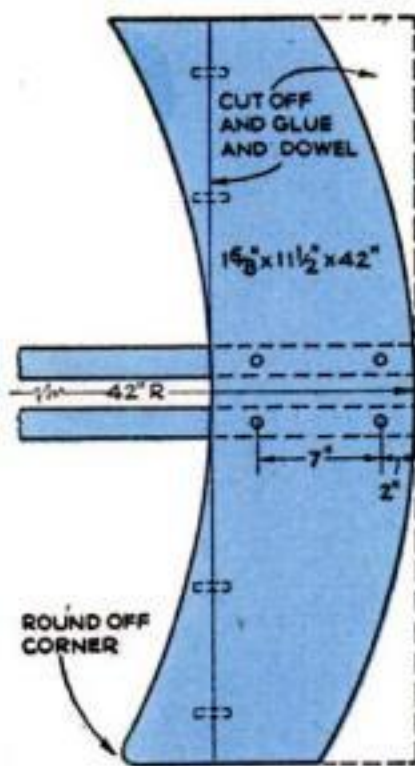




CUT DOUBLE NOTCHES in the centers of all cross braces so that they'll fit flush when crossed over. Drill $\frac{3}{8}$ " holes vertically through the braces, 2" and 9" from ends, for the seats.



CUT OUTER EDGE of each seat to 42" radius and save sawed-off pieces. Drill them for $\frac{3}{8}$ " dowels and glue them to inner edge to make a curved seat. Sand all the edges round.



so that the table legs will fit snugly between them.

Legs. Cut four 36" pieces for the legs out of the 14' length of two-by-six and trim both ends of each leg to a 50° angle. Cut a corner off the bottom of each to eliminate the long, sharp edge. Bore the top of each leg to match the holes in the cleats and bolt them in place.

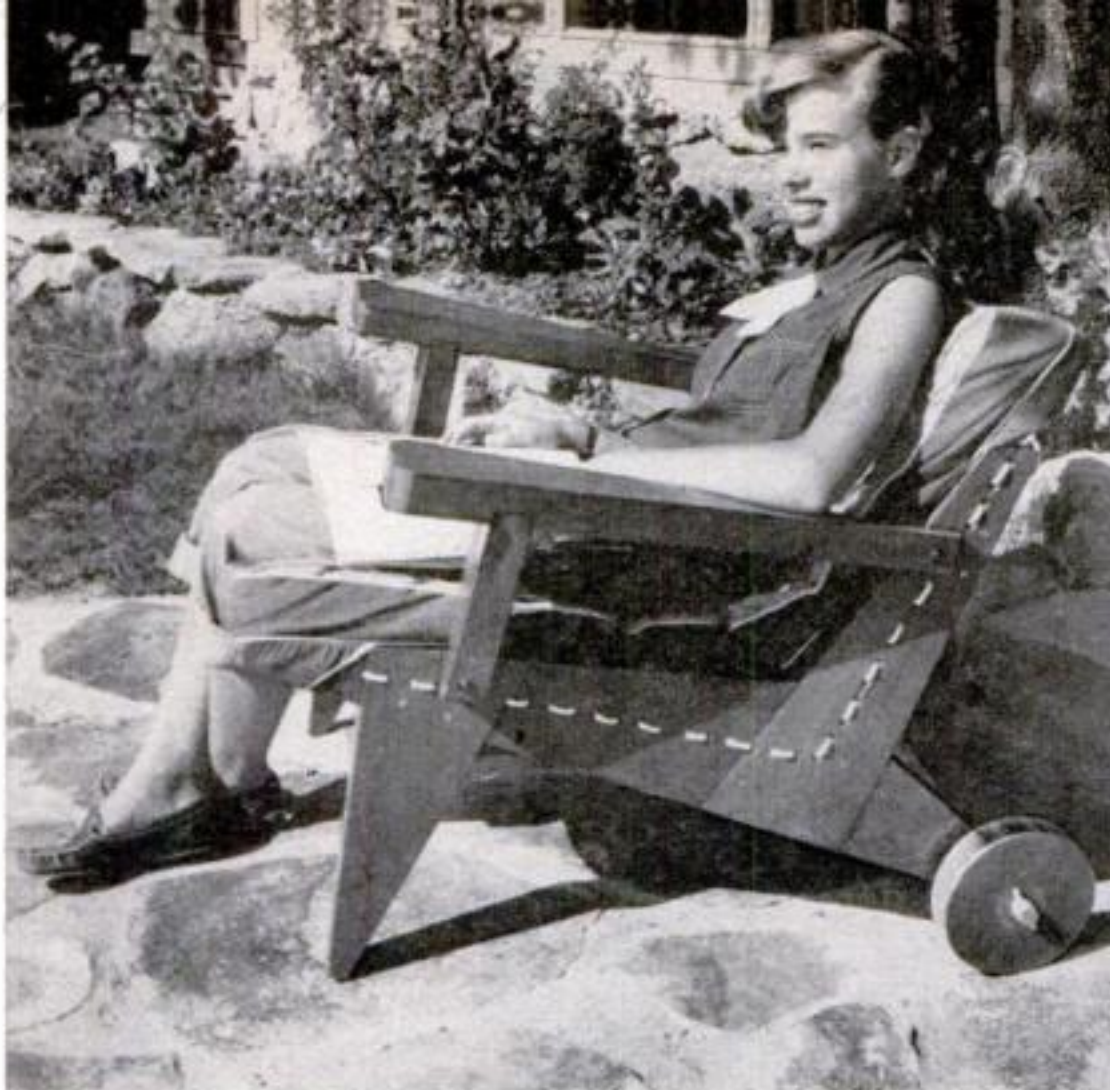
Cut the two-by-fours into 84" lengths and cut a double notch in the center of each so that they will overlap when installed. Clamp the first pair to two opposite table legs 16" up from the bottom. Bore two holes through legs and two-by-fours and bolt them together. Secure the second pair of crossbars in the same way.

Curved seats. Make the seats from four 42" pieces of two-by-twelve cut from the 14' board. Draw a 42"-radius curve near the edge of each piece and saw along the line. Save the pieces that drop off, drill them for $\frac{3}{8}$ " dowels and glue them to the opposite side to create a curved seat that will blend with (but not match) the radius of the table.

Bolt the seats to the table supports and brace the table with eight 42" screen-door braces. Tighten them until the table is rigid.

Sand the table thoroughly, taking care to remove sharp corners. Stain the wood or finish natural with varnish or other clear exterior finish.

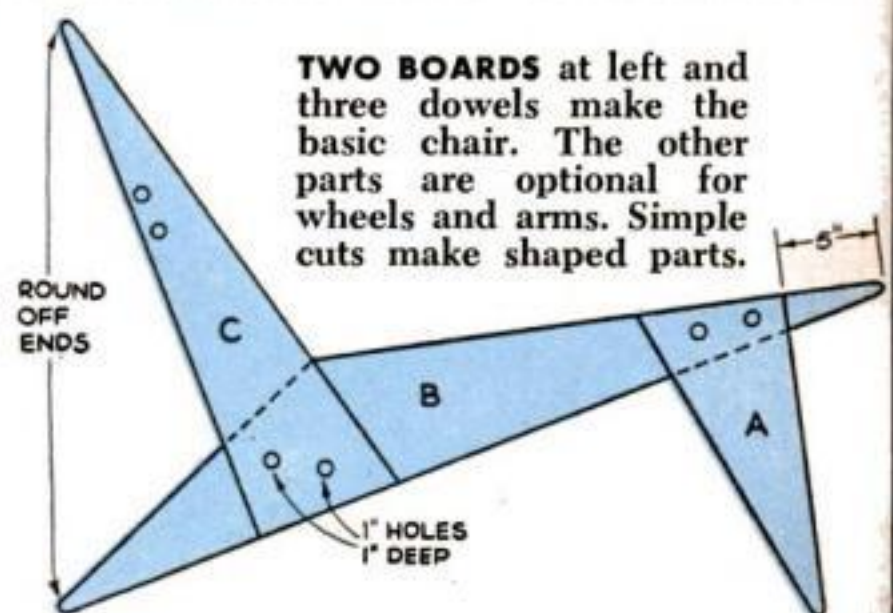
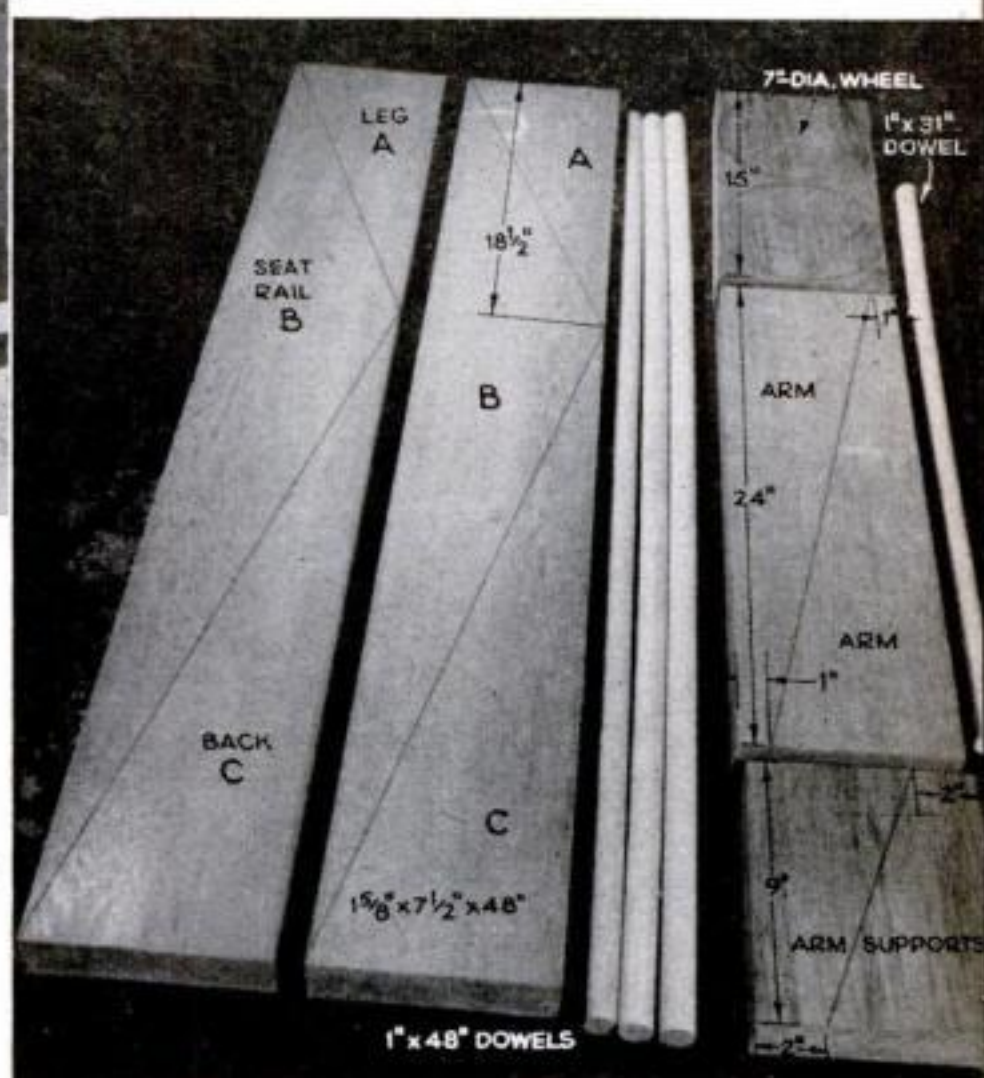
BOLT SEATS to ends of the cross braces. Attach screen-door braces from the center of each seat to the tops of the legs at right and left of it. Taking up on wire braces keeps table from swaying.



This Easy Chair Is Easy to Build

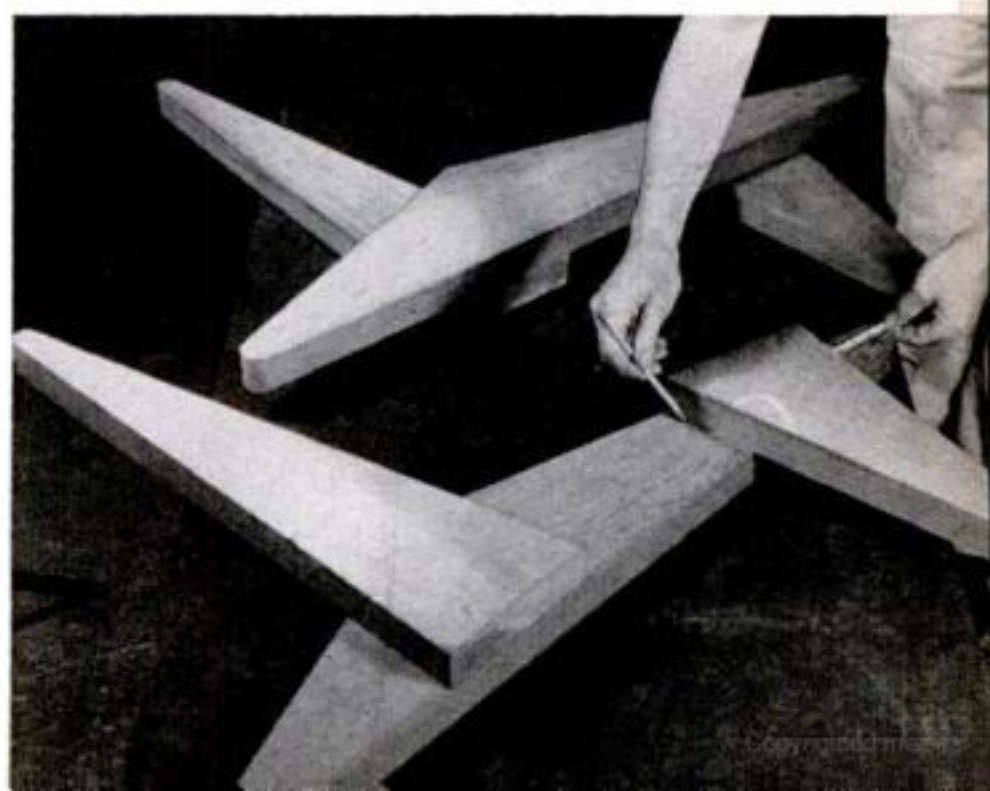
EVER start a project and wish you could stop before you'd finished? Here's one that'll let you. Build the basic chair and stop if you like . . . or go on to add arms to the chair. Again, stop . . . or carry the job to final completion by adding wheels and a dowel axle. No matter where you stop, it's an all-weather patio chair. A mail-order club-chair pad (22½" by 47") makes it an attractive upholstered piece of furniture on those cloudless, sunny days. Whisk the pad indoors when it looks as though a storm is brewing and it's still a good-looking patio chair—and comfortable, too, even without the pad to sit on.

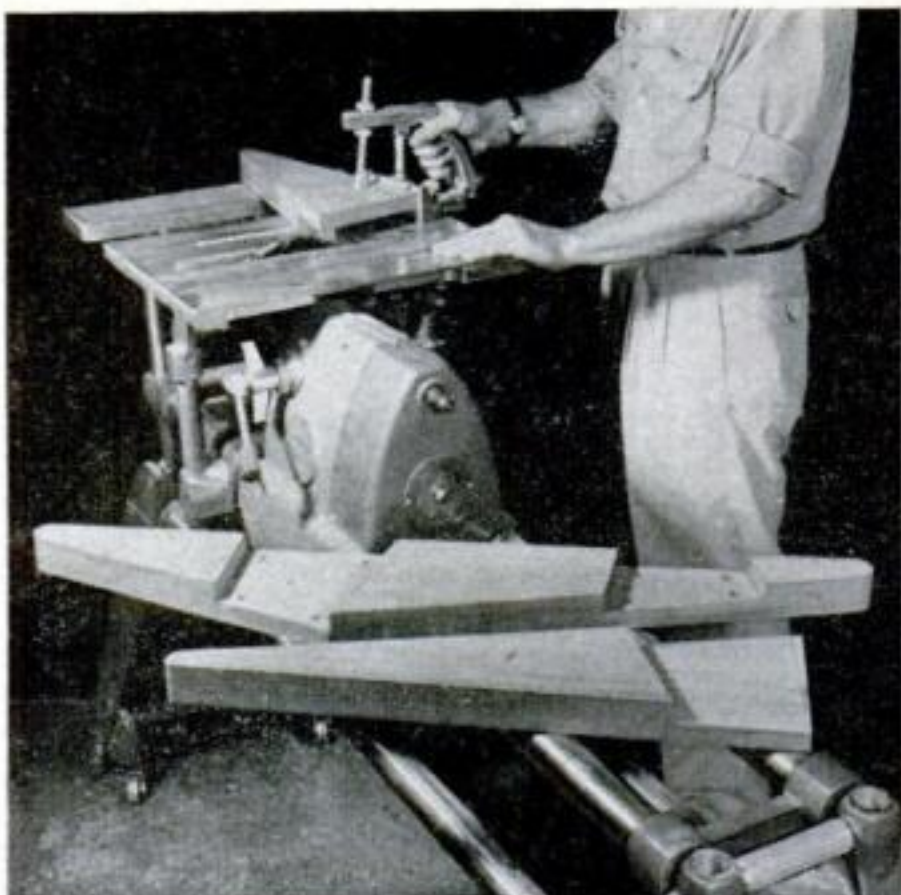
What you need. For the basic chair, buy two 4' lengths of two-by-eight, three 1" dowels 48" long, 28 wood screws No. 1½"-8, and 100 feet of plastic clothesline. To add arms to the chair, increase your order by two additional pieces of two-by-eight—one 9" long and one 24" long—four 2"-12 flathead screws, and four ¼" carriage bolts—two 3½" long and two 4½" long. Adding wheels requires 15" more of the two-by-eight, another 1" dowel



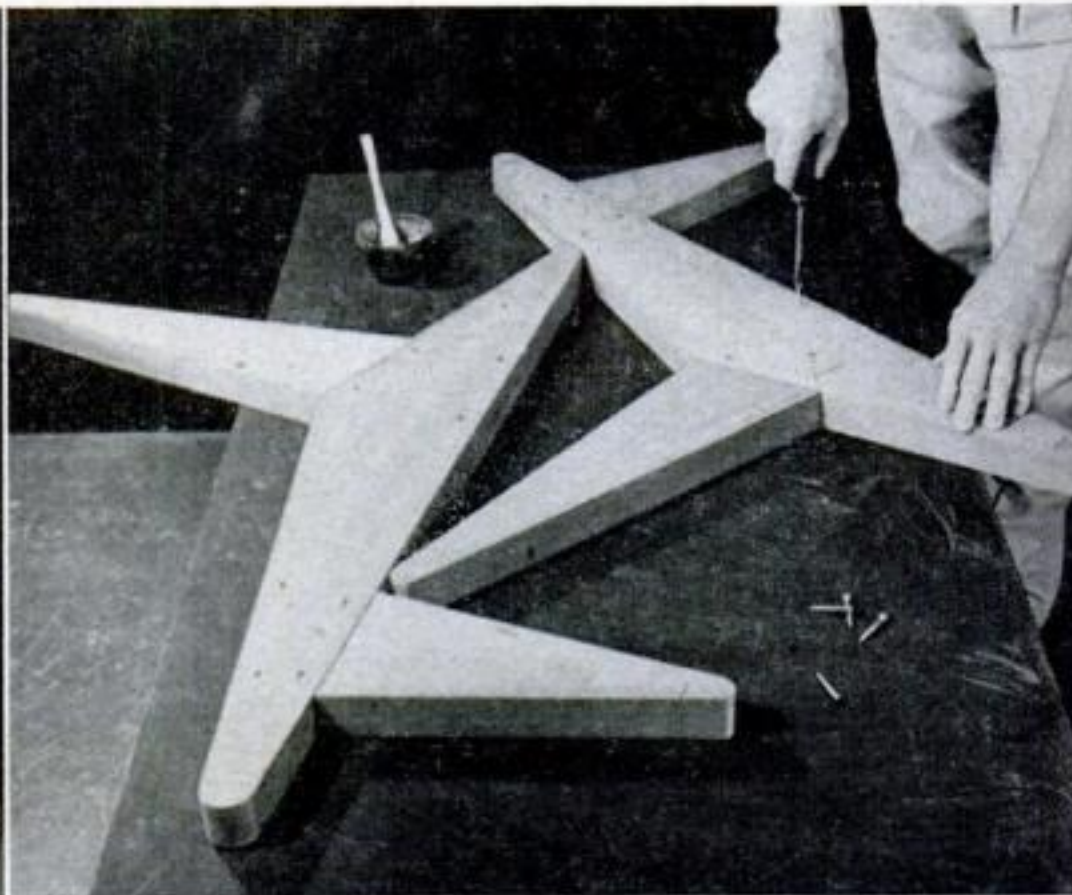
TWO BOARDS at left and three dowels make the basic chair. The other parts are optional for wheels and arms. Simple cuts make shaped parts.

ARRANGE PIECES to make one right- and one left-hand assembly. Place leg 5" from front of chair rail (shown being measured). Place the backrest so that its front edge is even with the vertex of the chair-rail triangle. Mark the joints.





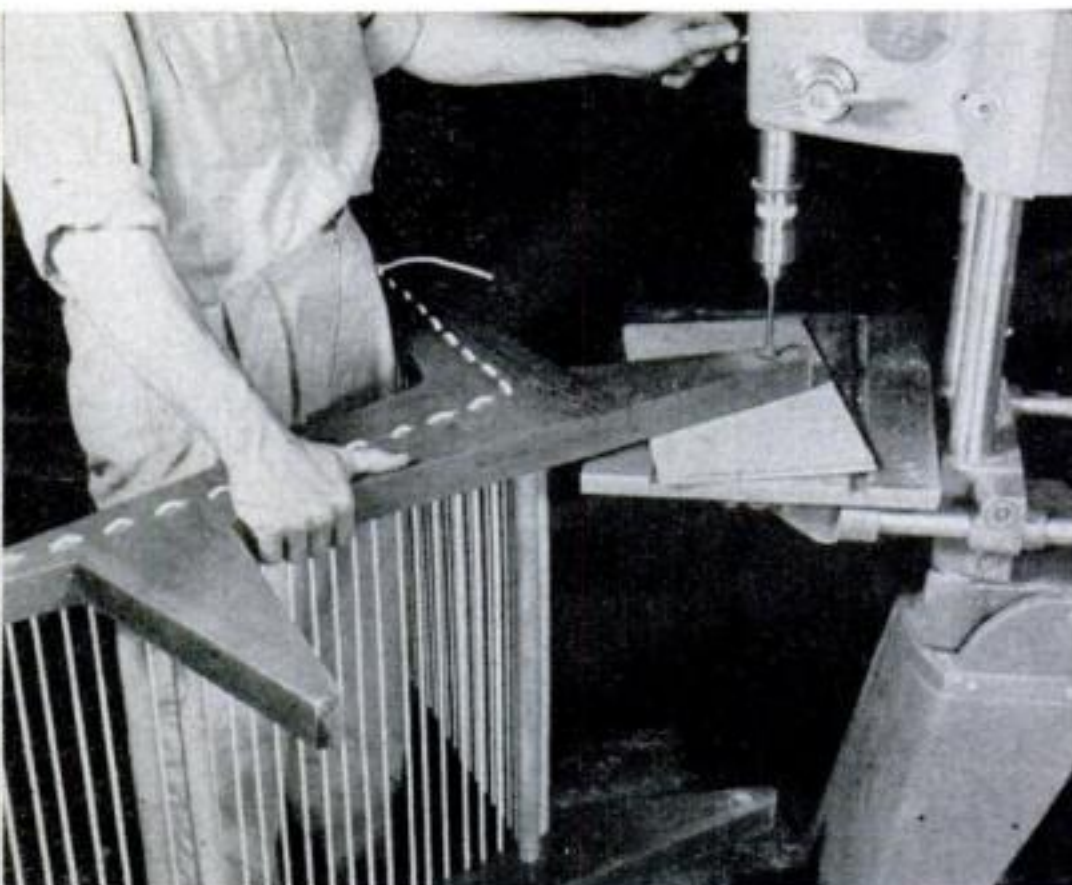
CUT HALF-LAP JOINTS in legs, backrests and rails, removing wood to exactly half the thickness of the stock. Drill four $\frac{1}{8}$ " holes in each joint of the chair rails for wood screws.



ASSEMBLE THE TWO SIDES, using screws and water-resistant glue. Screwheads should be countersunk, but need not be concealed as the screws are inside when sides are placed together.



STRING THE CHAIR with plastic clothesline, beginning at the front of the seat. Pull the line tight as you go. Take a final pull on it before securing by threading under the loops.



TO ADD WHEELS, bore 1" holes through the legs 2" up from bottom ends. The 7" wheels are roughed from two-by-eight stock, disk-sanded round, and bored 1" for the dowel axle.

31" long, and a short 4" piece of $\frac{1}{4}$ " dowel.

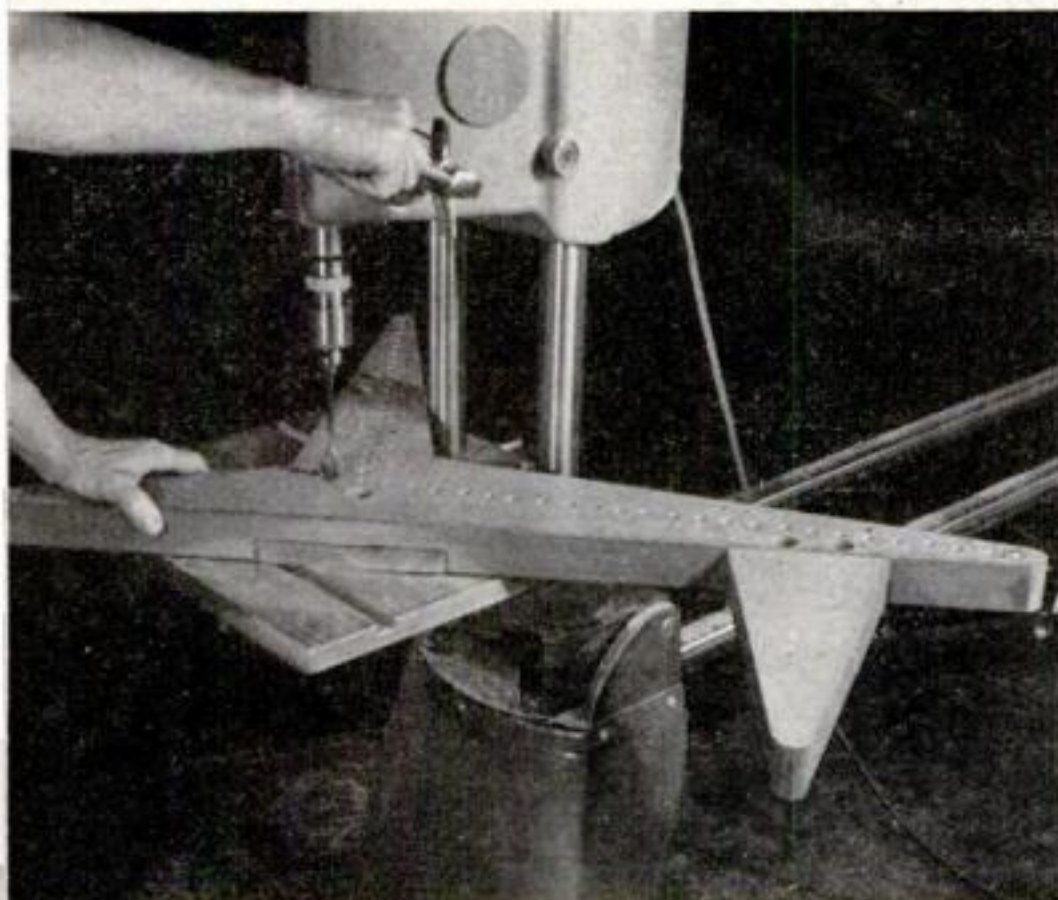
The basic pieces. Building the chair is an ABC job. Measure $18\frac{1}{2}$ " from a corner of each of the 4' lengths of two-by-eight and draw lines from that point out to the two corners on the opposite side of each board, laying out a long lopsided V.

Cut on this line to make three pieces

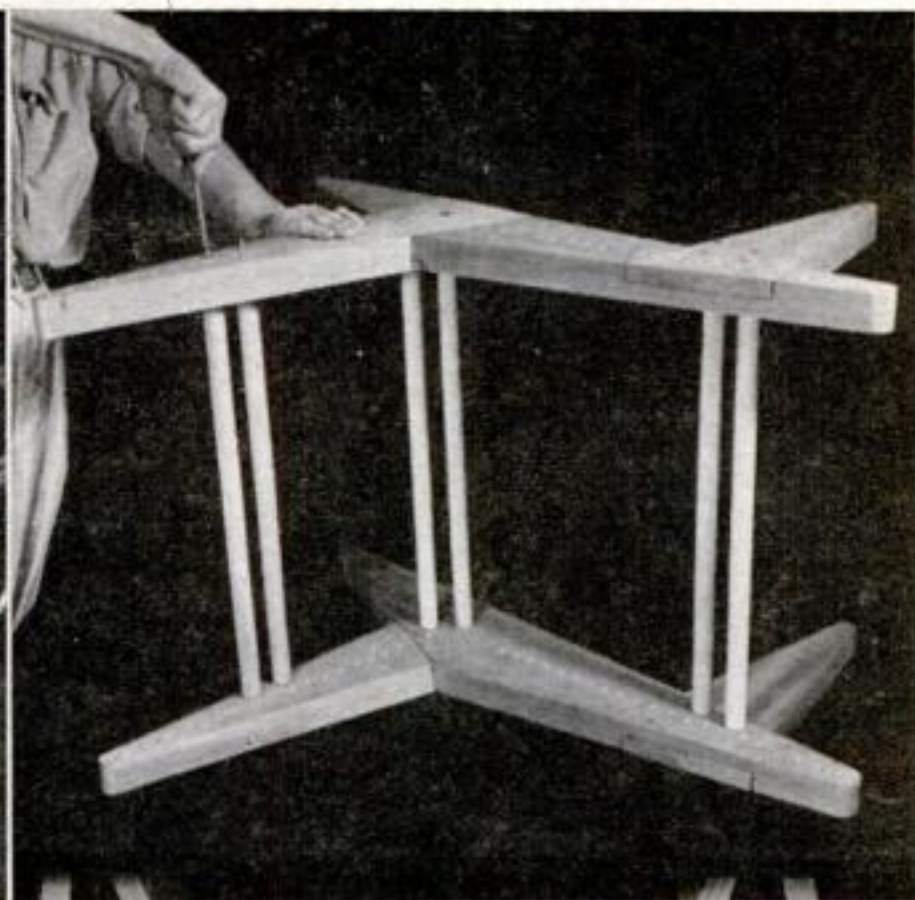
marked A, B and C out of each board. Plane these pieces smooth, then match them against each other for shape, and round off all sharp points.

Arrange each ABC set to form one side of the chair and mark the meeting surfaces for cutting half-lap joints. Cut the joints, drill pilot holes for the screws and the parts are ready to assemble.

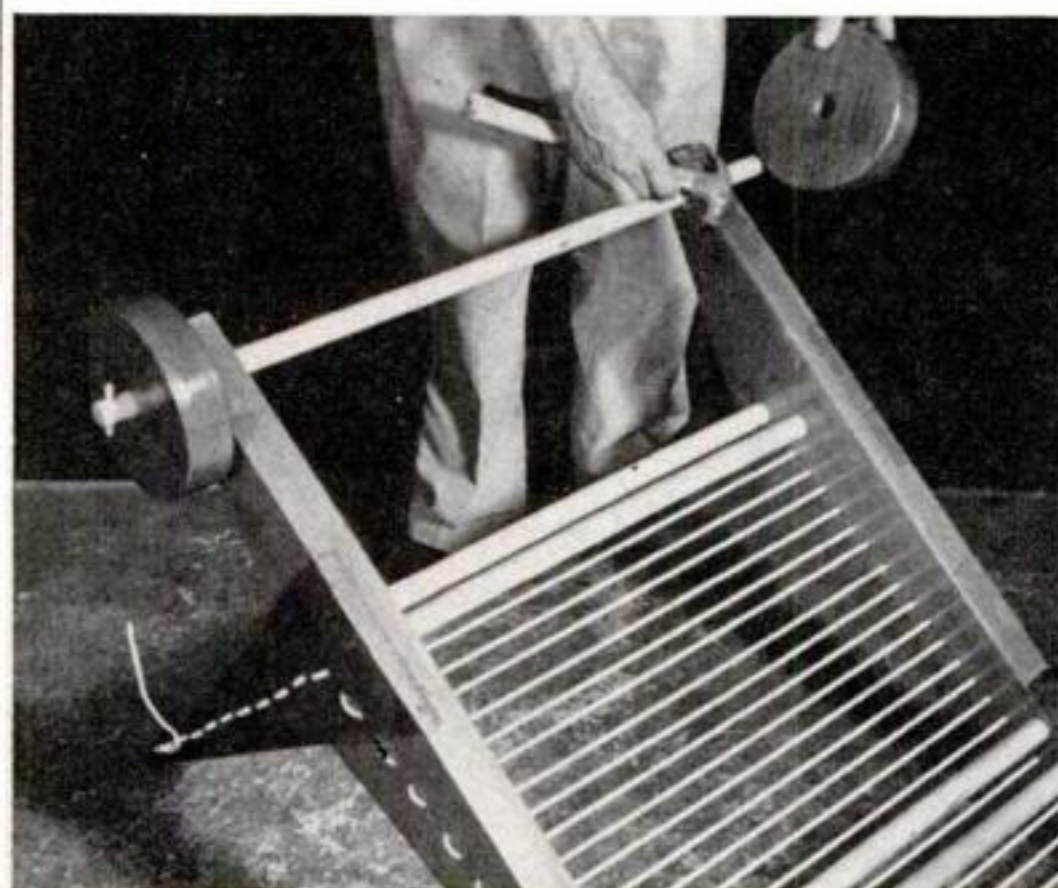
Cord and bracing. Draw lines down



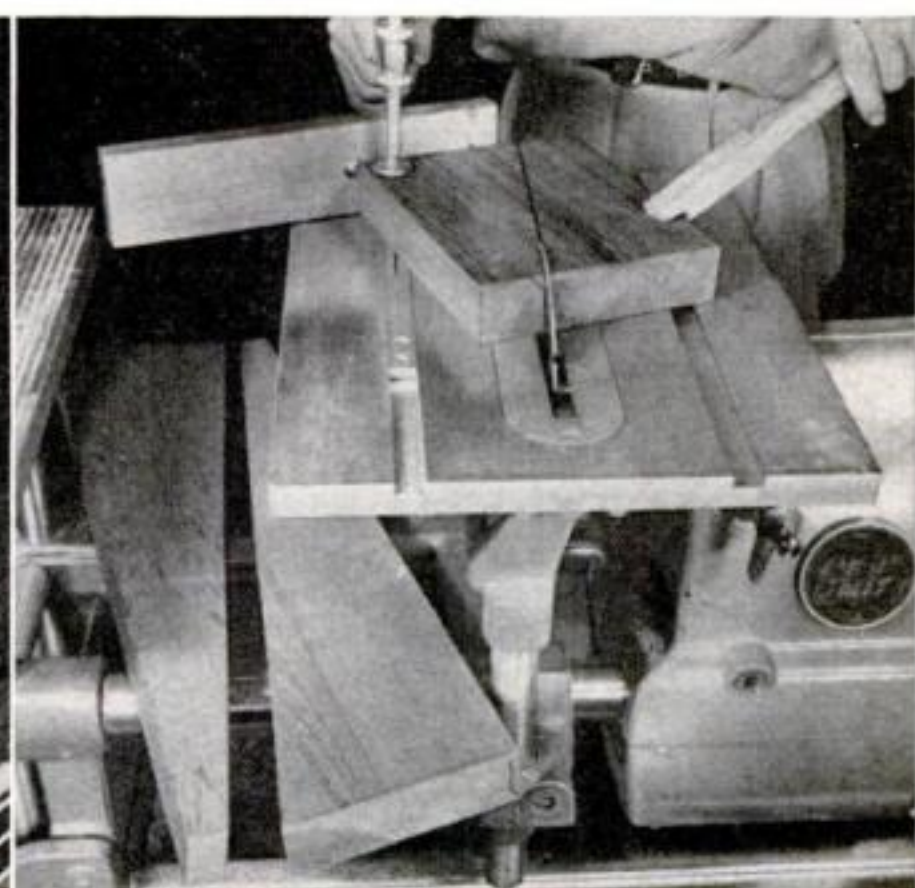
DRILL ROWS of $\frac{1}{4}$ " holes 1" apart for cord in rail and backrest. It may be easier to clamp frames together and drill both at once. Holes for dowel cross braces are bored 1" deep.



ASSEMBLE CHAIR with six 1" dowels, 24" long. Use glue, and drive screws through screw holes drilled in centers of the dowel holes. Sand the frame down smooth and then varnish it.



HOLD WHEELS ON AXLE with short pieces of $\frac{1}{4}$ " dowel driven into holes drilled near the ends of the dowel. Dowel for axle is 31" long. Varnish the axle, then wax for easy rolling.



ARMS make the chair complete. Cut them from a 24" piece of two-by-eight. Make the supports from a 9" piece. A diagonal cut, as above, produces two matching pieces from each board.

the center of each backrest and rail. Beginning where the lines meet (just above the rear leg), drill $\frac{1}{4}$ " holes for the cord. Place one assembly with screwheads up and bore three pairs of 1" holes, 1" deep and 2" apart for the cross braces. Drill $\frac{1}{8}$ " pilot holes for screws in the center of each of these holes. Then place this assembly on the other one so that the screwheads are together. Insert a pencil

through the pilot holes and mark the matching locations of the 1" holes in the opposite assembly. Similarly, bore this assembly for cross braces, and drill pilot holes. Cut the 1" dowels into 24" lengths and use them to join together the two side frames.

Thread plastic clothesline through the $\frac{1}{4}$ " holes in the sides, starting at the front edge of the seat. Drop in a standard 22 $\frac{1}{2}$ "-



DADO IN ARM fits over the support. Glue and flathead wood screws join the parts. Countersink the screwheads deep and conceal them with plugs or cover them up with wood putty.

by-47" club-chair pad or make your own pad by covering foam rubber with fabric or plastic.

Instead of dragging your chair out onto the patio, you could roll it out. How? Make your own wheels and pin them to a dowel axle, as shown in the photos on pages 150 and 151.

How to add arms. If your elbows are

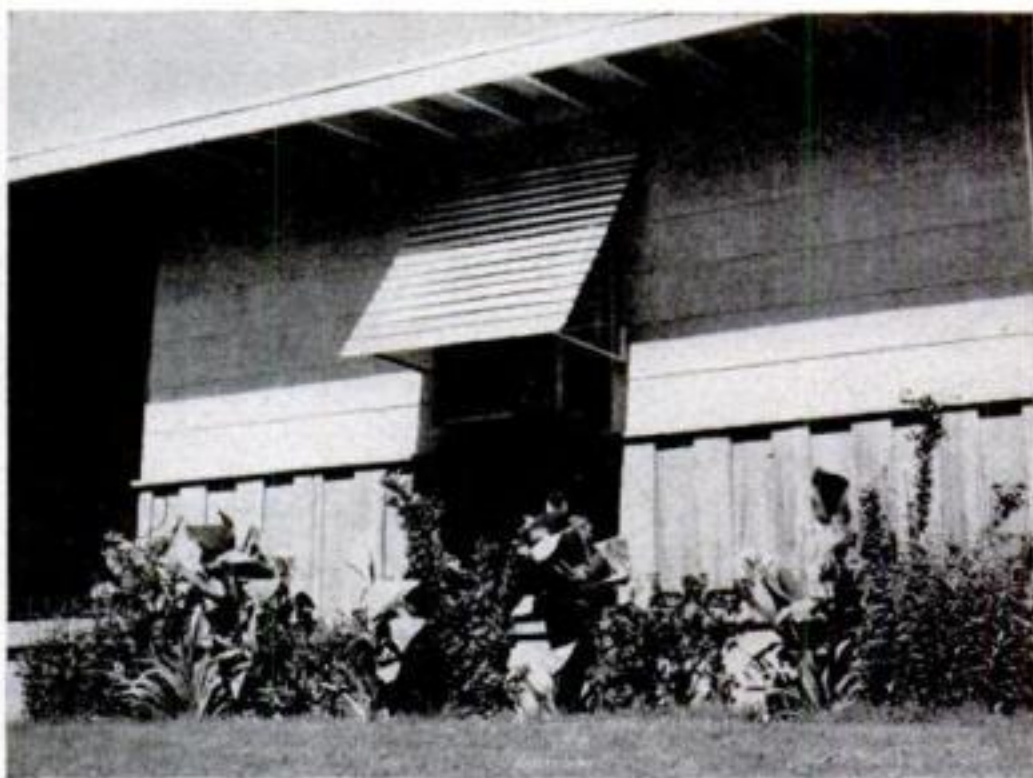


BOLT ARMS TO SIDES. Drill $\frac{1}{4}$ " holes for carriage bolts 1" in from the narrow ends of both arms and supports. Position the arm, drill matching holes in each side and insert bolts.

lost without something to lean on, arms on your chair will put them at ease. Cut the pieces from two-by-eight. A dado, $\frac{1}{2}$ " by $1\frac{3}{8}$ ", across the bottom of each arm 4" from the broad end fits the arm over the top of the support.

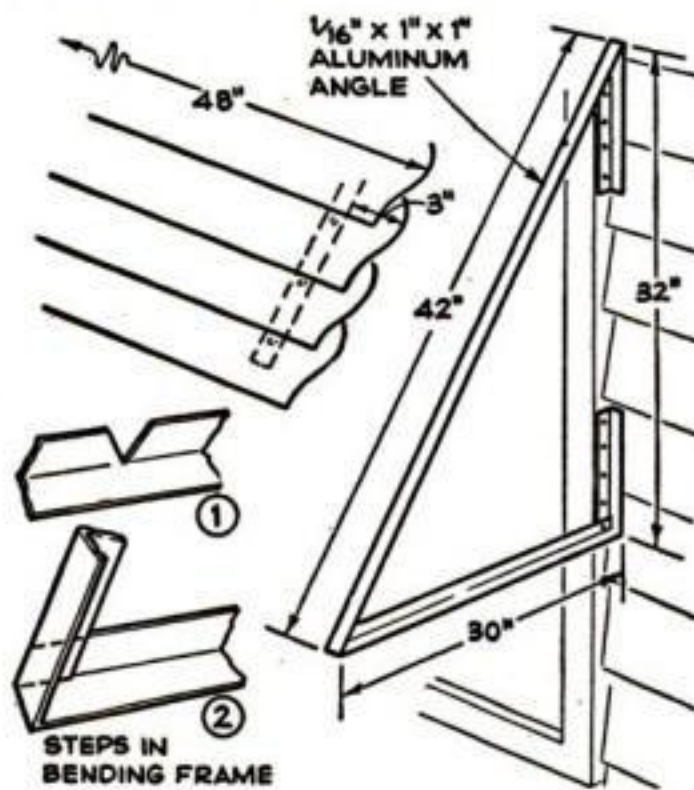
After the arms and the supports have been assembled, attach them to your new patio chair with carriage bolts. **END**

Louvered Awnings of Corrugated Aluminum Dress Up House



AWNINGS that shut out hot sun and let breezes in are a cinch with do-it-yourself aluminum. One 4'-by-8' corrugated sheet and four 8' lengths of aluminum angle will shade two windows.

Bend the angles for frames, as shown in the drawing, and screw one to each



side of the window casings. Then saw the sheets into strips of $1\frac{1}{2}$ corrugations each (a circular saw does it quickly).

Attach the strips to the frames with sheet-metal screws. Begin at the bottom and space them to admit air without sunlight.—Edwin F. Thomas, Fort Worth.

How to Make an Old Fan Look New

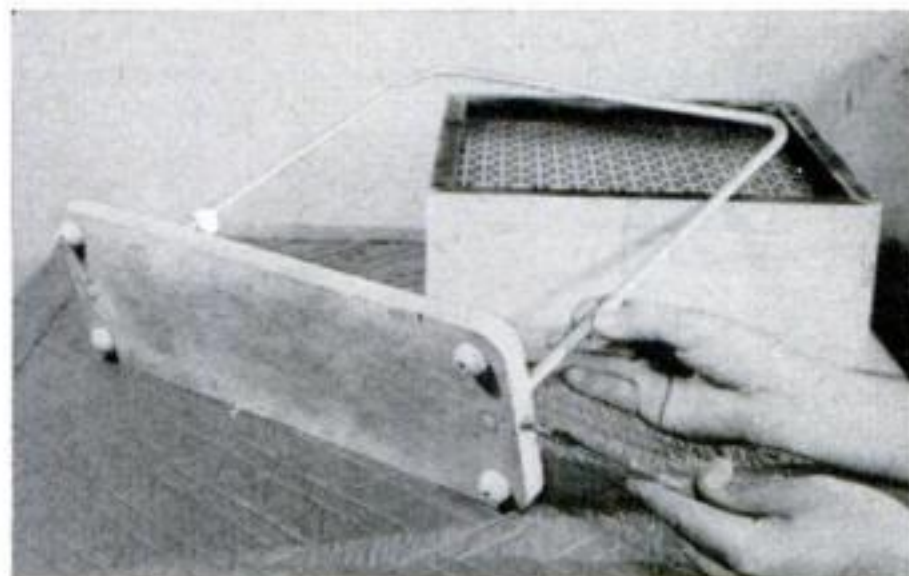
DRAGGING out that old fan this summer will probably remind you that the newer ones look a lot nicer, channel the breezes better and are safer to handle. You can make one of these handsome modern types by hiding the motor and blades of the old fan in a simply made tilting case of wood.

First strip down the old fan, discarding its base, oscillating mechanism and blade guard. Saw off any excess shaft at the back of the motor to reduce the cabinet depth required.

The case is $\frac{3}{4}$ " pine, its inside dimensions 1" bigger than the fan-blade diameter and 2" deeper than the depth of motor plus shaft. Rip a groove $\frac{1}{4}$ " deep in the sides, 1" back from one edge, for the aluminum grille to slide into. The joints are mitered and fastened with nails and glue. A metal strap holds the fan.

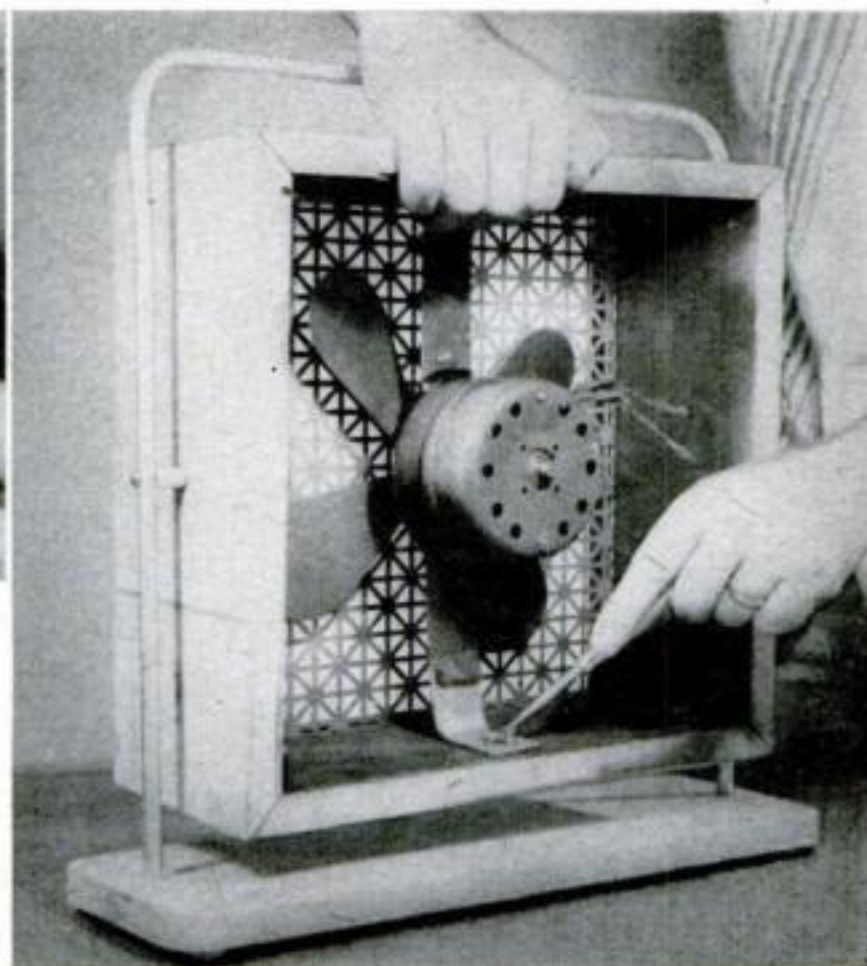
The case is suspended from a bent $\frac{3}{8}$ " aluminum rod that also forms a carrying handle. Stove bolts connect the case and rod, running through spacers of tubing or drilled dowel. Lock washers inside the case provide tension to keep the case tilted at any angle.

The rod fits into a $\frac{3}{4}$ " pine base that is 3" longer than the case and as wide as the case is deep.—*Ronald L. Anderson.*



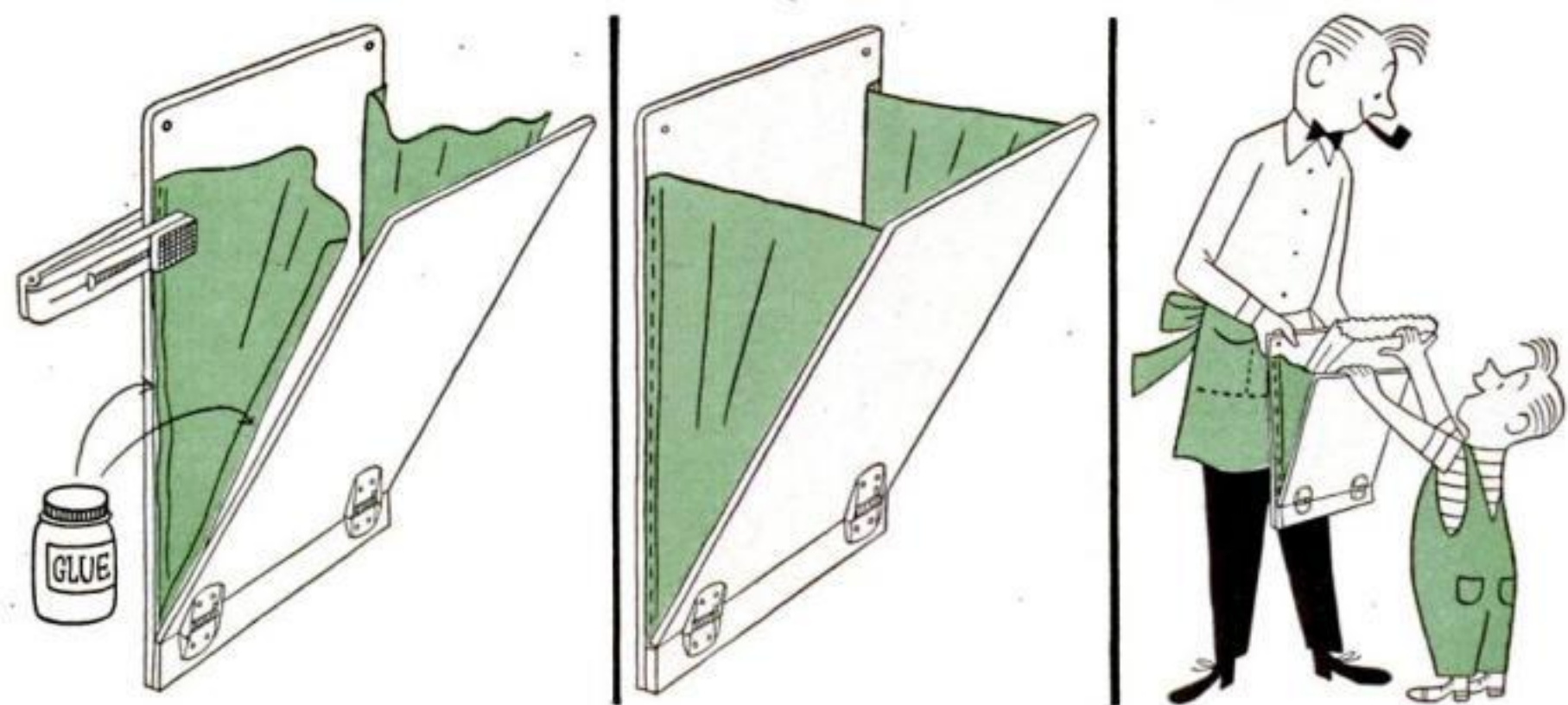
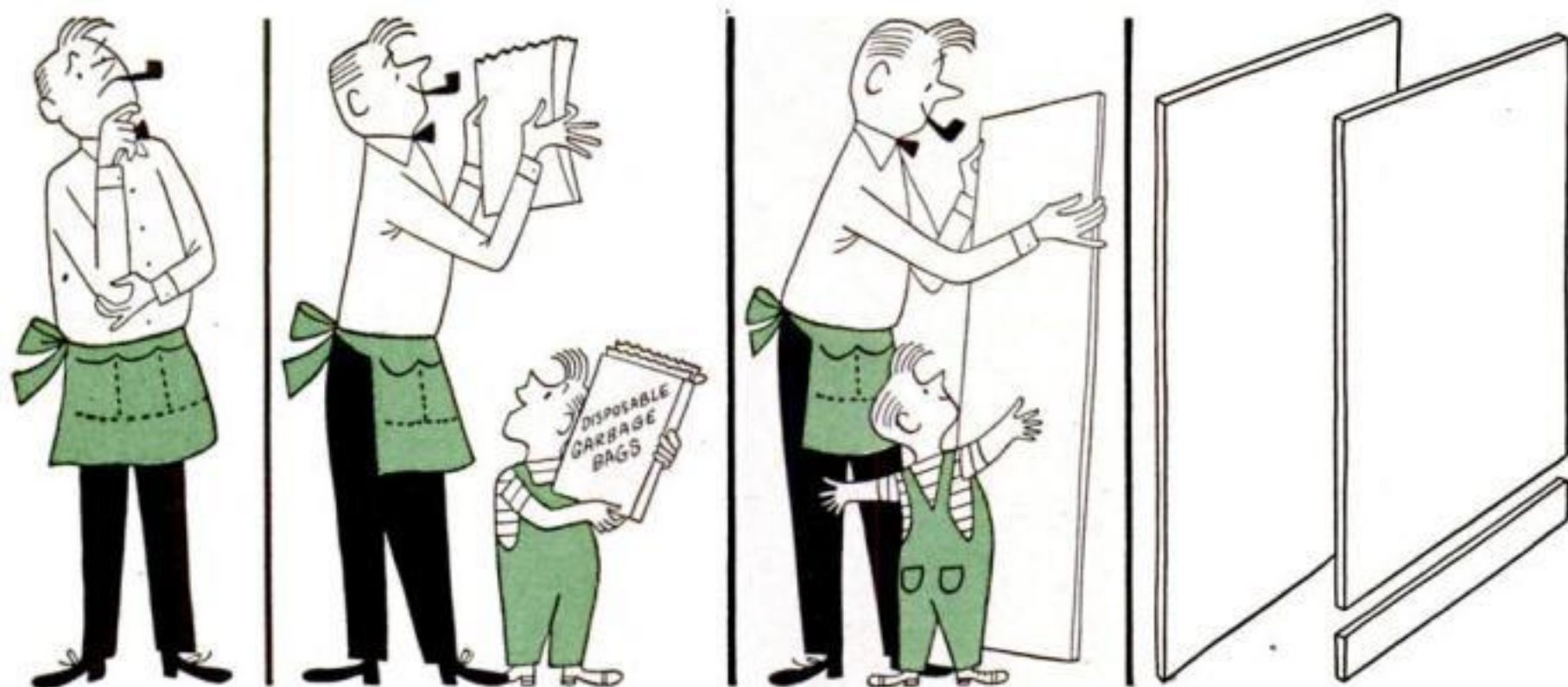
U-SHAPED ROD serves as frame and handle for modernized fan. Ends go in holes drilled through base and are anchored with wood screws from the side. Base has dime-store rubber feet.

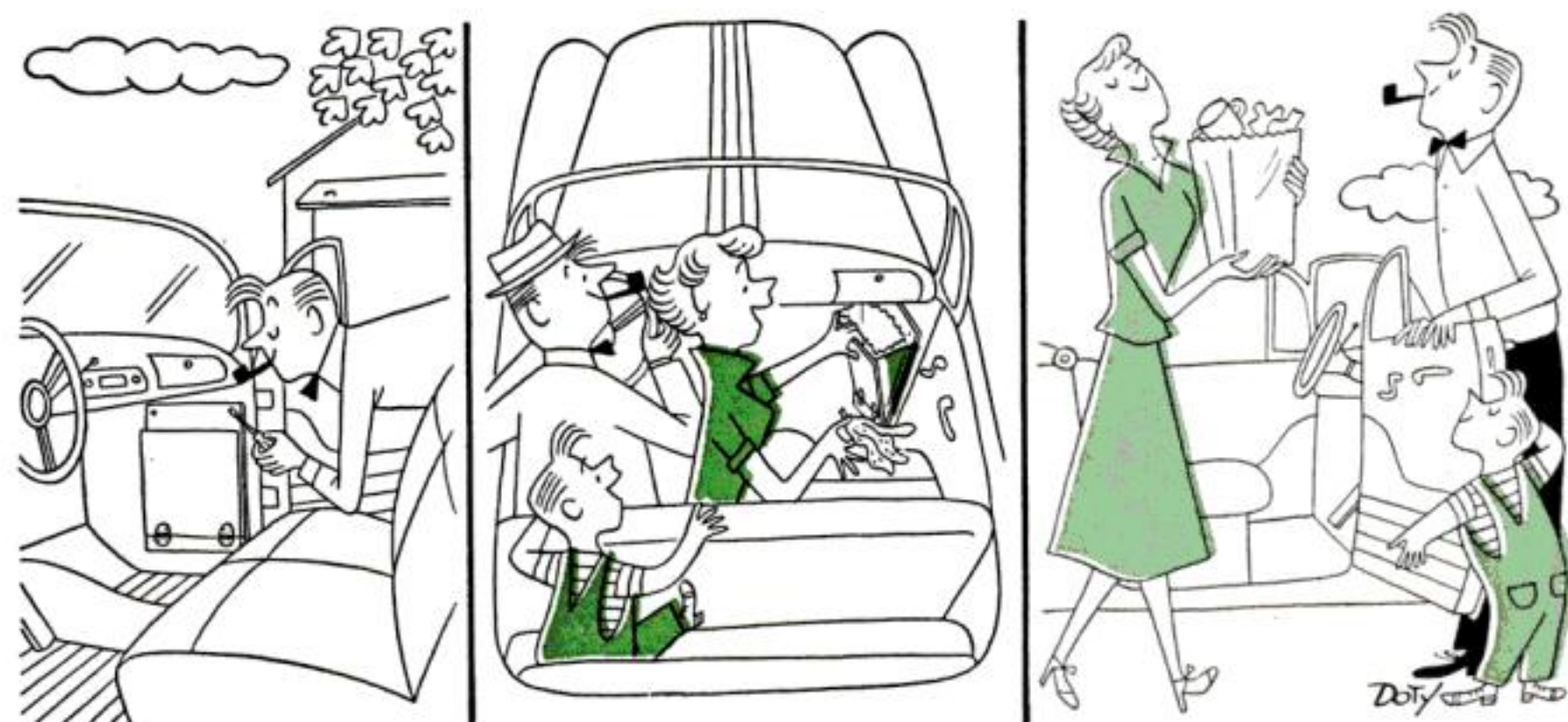
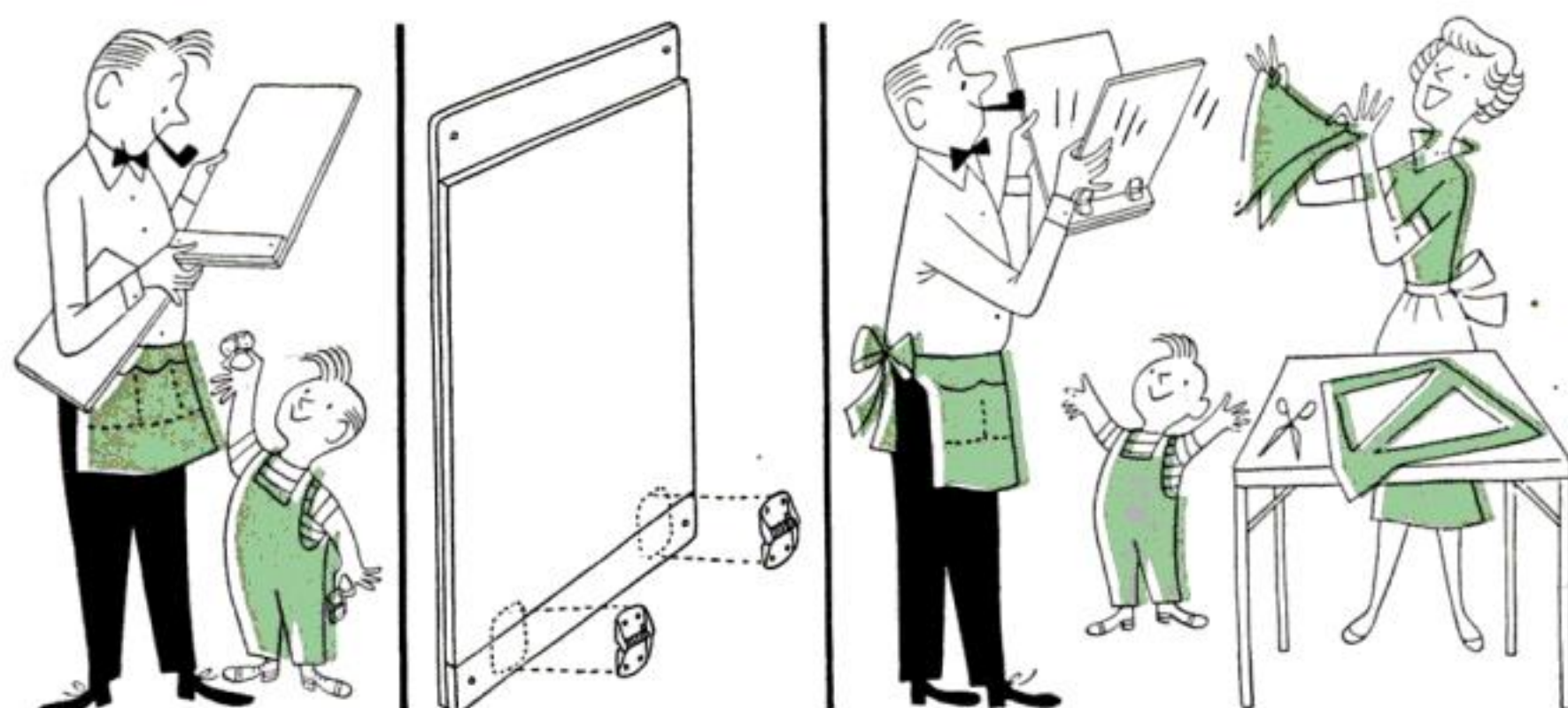
METAL SUPPORT STRAP, drilled to take motor studs and slotted to clear the shaft, is screwed into case (right). Paint motor and inside of case before assembly, and tack on a rear grille.



By Roy Doty

Wordless Workshop





Next Month: A double-decker bunk bed for a pair of pets JUNE 1956 155

Handsome Walk Is Made of Different-Colored Cinder Blocks



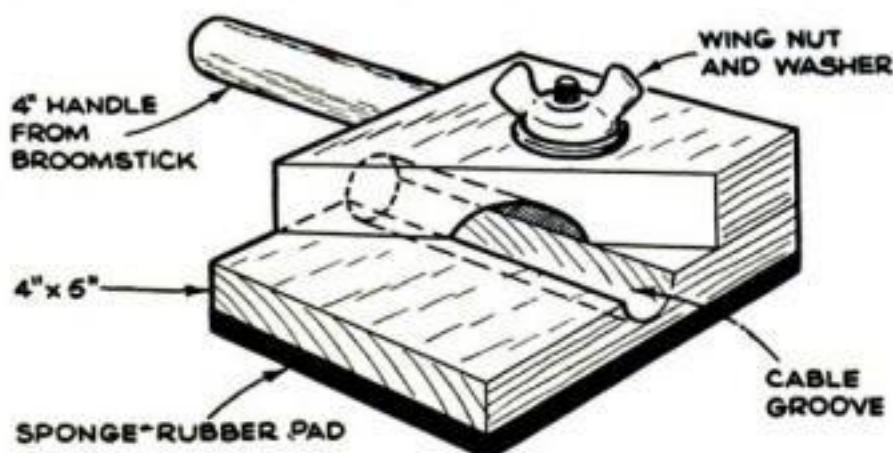
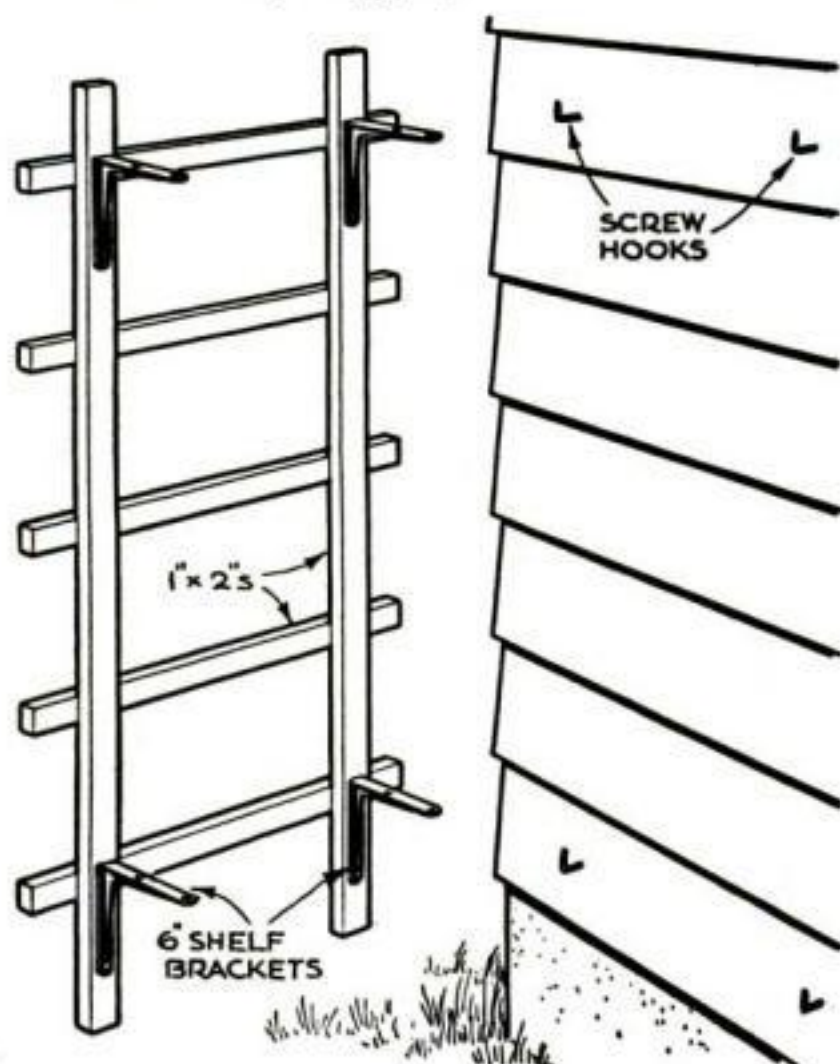
A VARICOLORED walk of half-thick cinder block rivals flagstone. The blocks come in pink and two shades of gray and are 4" thick by 8" by 16" on a side.

Place the non-skid blocks on a 1" layer of well-tamped sand. You can keep them in a straight line by stretching a string along one edge. Use a regular color pattern for best effect.—David X. Manners, Norwalk, Conn.



Trellis Lifts Off for Paint Job

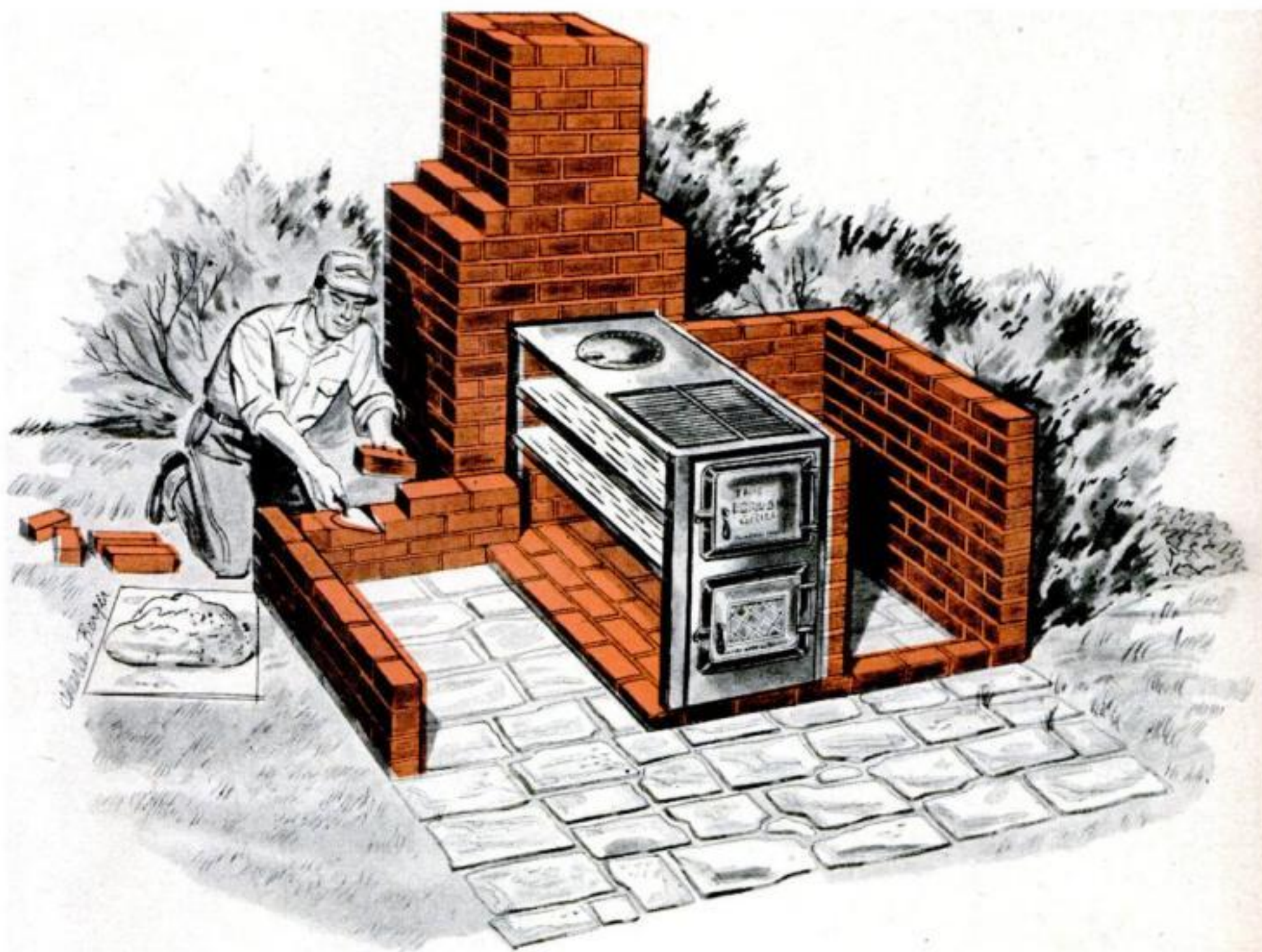
VINES are pretty climbing up a house, but they get in the way of periodic house painting. To have your vine and an easy paint job, too, make a detachable trellis. Shelf brackets on the trellis fit screw hooks in the house siding. When painting time comes, you can simply detach the trellis and lay it on the lawn.—G. E. Hendrickson, Argyle, Wis.



Saw Clamp Steadies BX

Armored cable will hold still for your hacksaw if it's clamped between two blocks. Cut the top block on a bias at right angles to the loops of sheathing. Groove both blocks to hold the cable, using a router bit or file. The broomstick handle fits into a blind hole in the bottom.—Robert Lemp, Sayville, N. Y.

Prefab Fireboxes Make Barbecue Building Easy



By Sheldon M. Gallager

BACK-YARD barbecue builders are getting a whole new crop of prefab aids to make the job go faster.

These are ready-made grills and fireboxes that you surround with simple masonry enclosures to turn them into fully operating outdoor fireplaces. You can buy a prefab unit, complete with adjustable grates, a fire door and an ash-pit door, for as little as \$30.

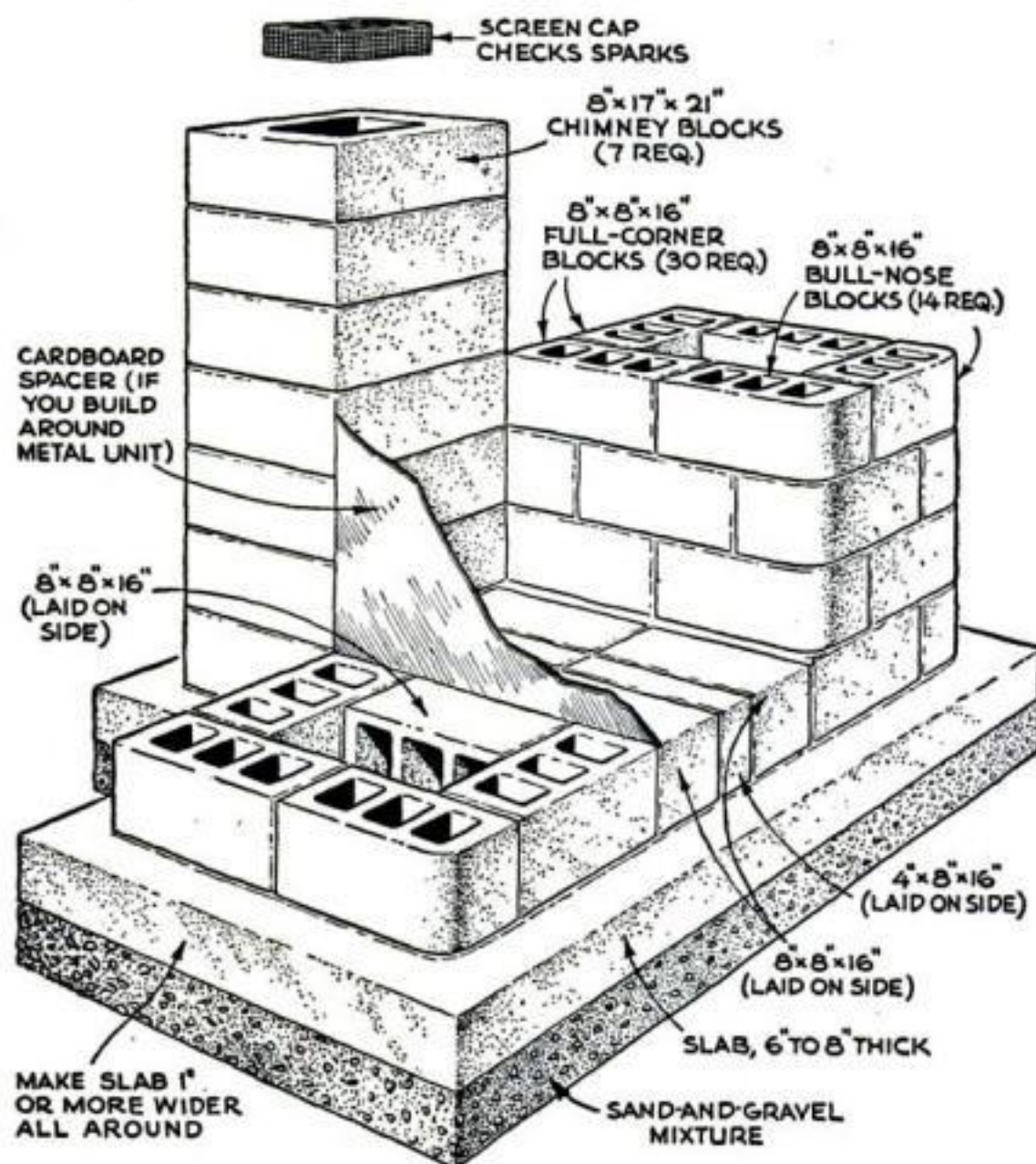
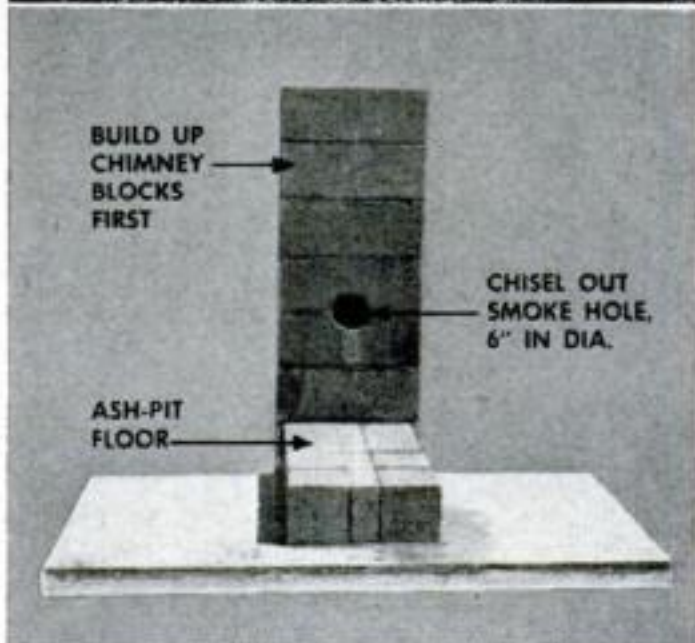
Most models can be slipped out of the masonry enclosure, knocked down to a

car-trunk fit, and carried with you. For temporary use, they work well without an enclosure. In winter, you can store them indoors to prevent rusting and weathering. In addition to open grills, you can get such frills as a Dutch oven for boiling and baking, griddles, surface-cooking tops, even an incinerator.

Setting it up. The metal unit comes disassembled and can be bolted together, ready for use, in a few minutes. The kind of masonry you surround it with depends only on your taste, skill and time.

Before you mix up the mortar, it's a

Concrete blocks plus firebox make a neat and simple barbecue



BLOCK ENCLOSURE starts with slab, for which one-by-eight form boards are set above sub-base (top left photo). Chimney, of standard square "doughnut" blocks, is built up next. Blocks on their sides form ash-pit floor. Slate or concrete slabs make "counters." This barbecue, designed for Majestic firebox, can often be bought as a package that includes both the metal unit and masonry materials.

good idea to pile the blocks or stones loosely around the firebox and test-run through a couple of steaks to see how you like it.

Location. For the sake of your neighbors and guests, try to place your fireplace so that it doesn't spew smoke either at you or at the house next door.

The best spot is on high ground with the front facing in the direction of prevailing winds to provide good draft and carry the smoke up and away. Keep the grill away from valuable trees, as the heat may eventually kill them.

The slab. Because the foundation is relatively small, you can "float" it on a bed of sand and cinders, instead of on deep footings. The slab will rise and fall slightly without harm.

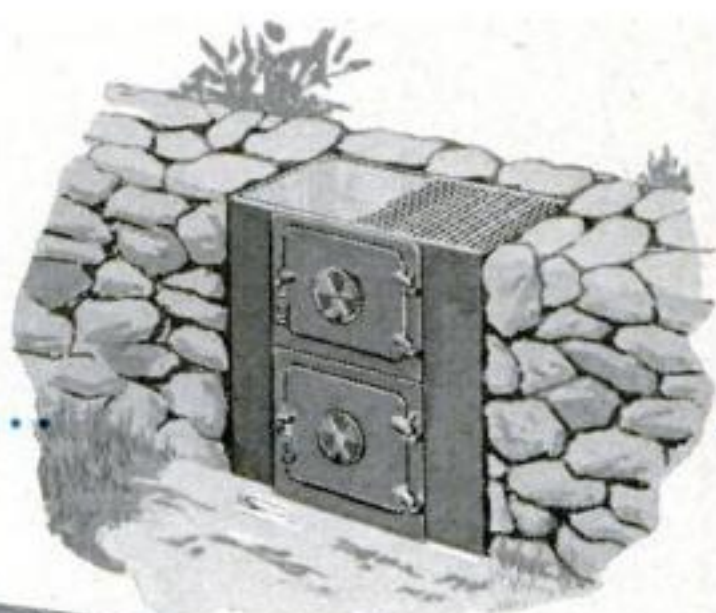
Lay out the slab 1" wider than the fireplace, allowing for $\frac{1}{2}$ " mortar joints between your blocks. Dig a pit about 10" deep and fill the bottom 6" with sand and gravel mixed together. Set form boards so that the slab will project 2" to 3" above ground level.

Mix the concrete no leaner than one part cement, $2\frac{1}{2}$ parts clean sand and four parts gravel. Pour 3" or 4" of concrete, then lay in the reinforcing mesh—10-gauge wire or even old fencing. Pour the remaining 3" or 4" of concrete and tamp firmly around the wire, but *don't* push the wire down—it must remain suspended about midway. Let the slab dry under wet burlap for at least two days before building on top of it.

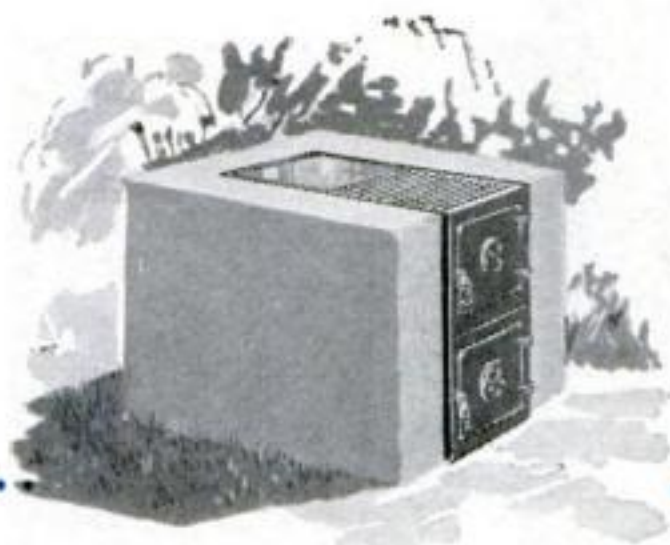
Laying the blocks. Most fireboxes are

Pick a prefab to suit your space and cooking needs

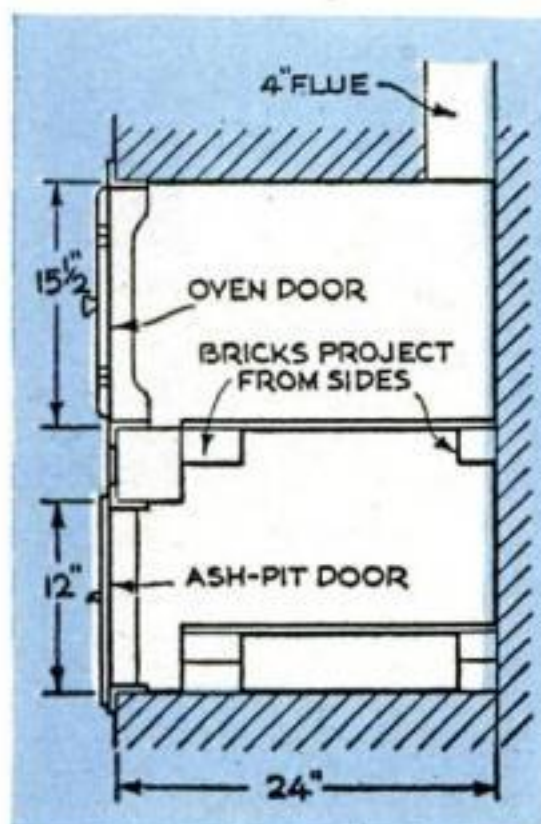
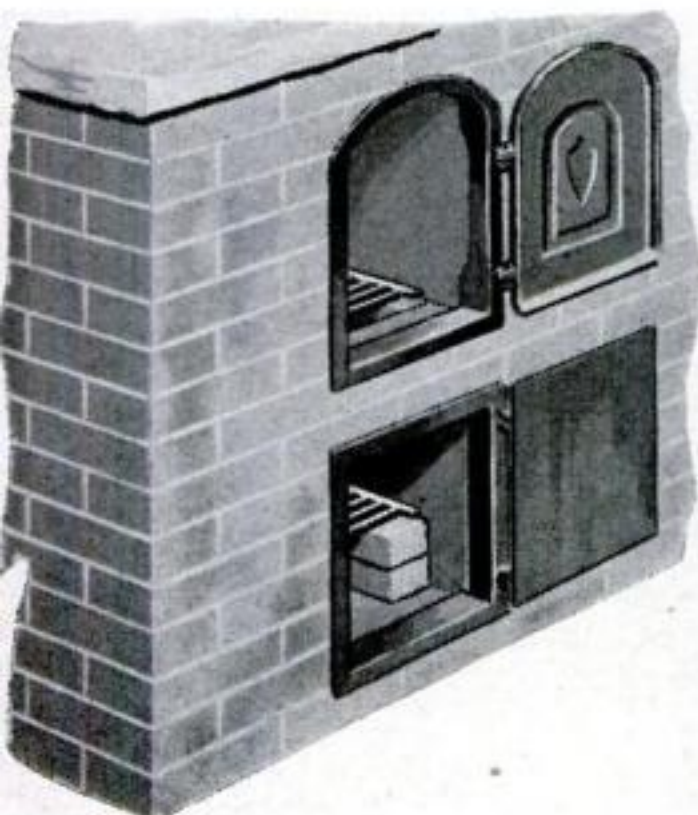
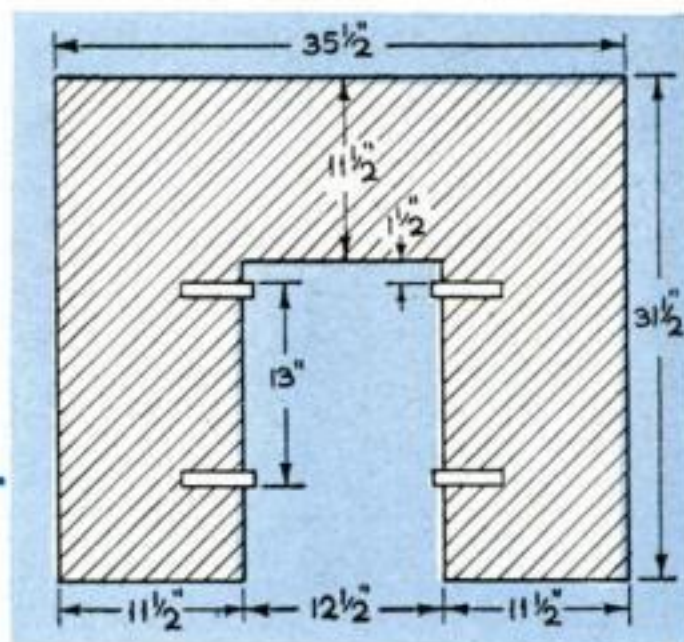
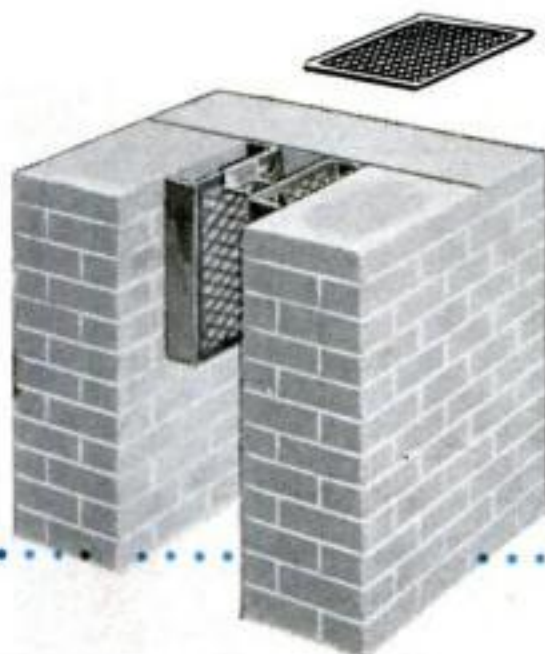
SHALLOW FIREBOX is designed to fit into a garden wall. This model has a removable top in two sections so that you can use it as double grill, double solid top, or combination of both.



NARROW FIREBOX is meant for free-standing barbecue, needs only a little space. It offers same cooking area as shallow wall type. Upper door is for fire, lower door for the ash pit.

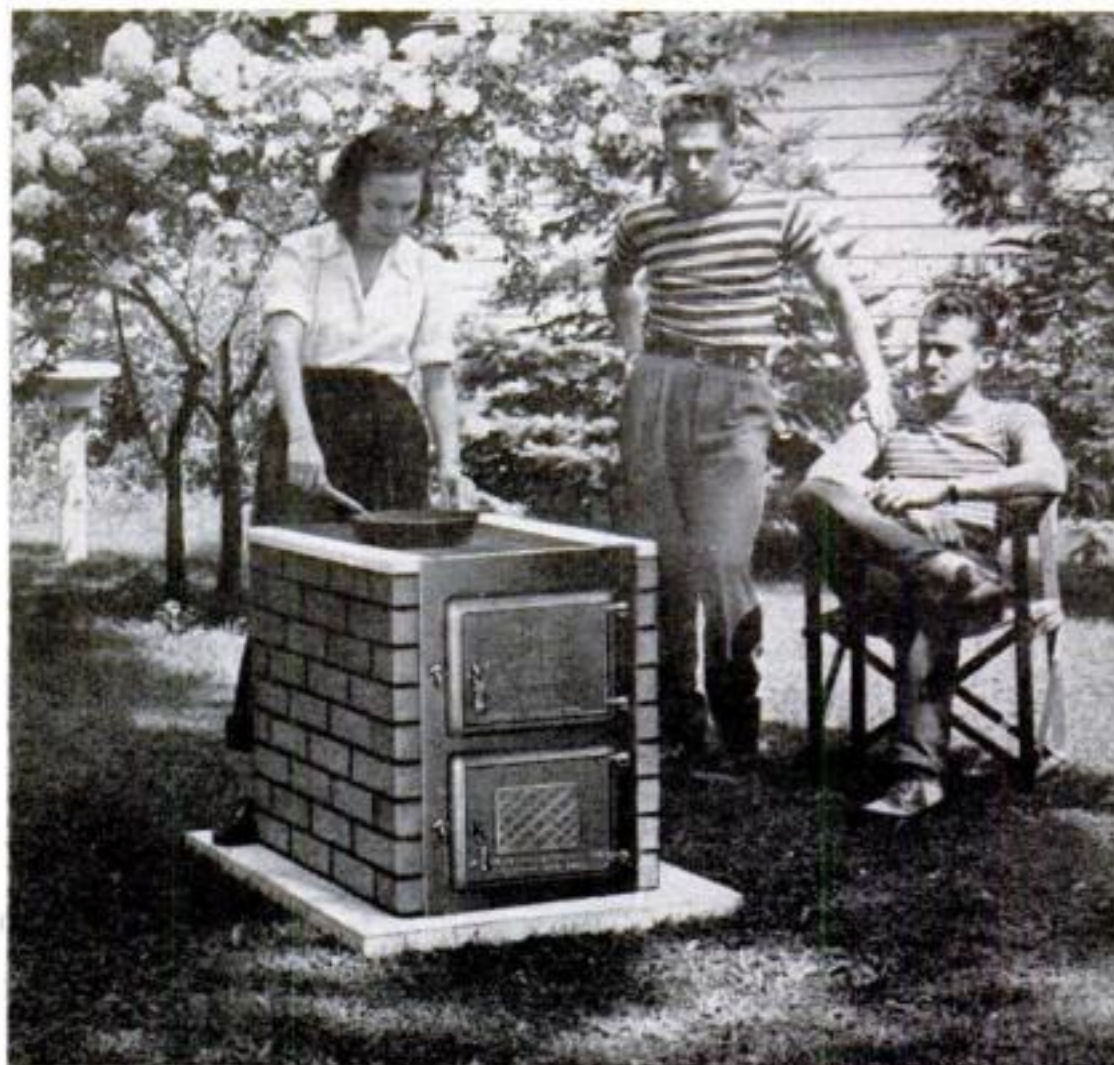


VERTICAL FIREBOX cooks both sides of meat suspended inside it, and prevents grease from dripping into fire. This Donley unit is removable, hanging on hooks embedded in masonry.



DUTCH OVEN consists of two separate self-framed metal doors that are cemented into a hollow opening in the masonry. To support upper grate, the masonry is constructed with a ledge of brick projecting slightly inward on each side. The fire is laid on the lower grate, which is blocked up on bricks at the corners.

Fancy layouts, simple grills, start with built-in fireboxes



FOR CHARCOAL COOKING, an enclosure of firebrick—one brick thick, without a chimney—was built around this Homer firebox.

designed to fit within standard blocks and bricks so that you don't have to do any cutting. Some are tall enough to stand directly on the concrete slab; others must be blocked up to a comfortable work-surface height (30" to 32"). This is another good reason for laying out the blocks loosely—it gives you a chance to see how many rows you'll need.

You use the firebox as a form and build the enclosure around it—but not mortared directly to it. Set sheets of corrugated cardboard against the metal sides and build the masonry against these. The fire will burn the spacers away, leaving a gap so that the metal can expand.

If your firebox has open sides, you may want to enclose it with fire bricks. Set them edgewise for a lining, flatwise for a single-wall enclosure. Use special fire-clay mortar, not regular cement, and keep the joints extra thin—about 1/16". A firebrick lining is a must if you build with either limestone or sandstone, as these crack easily under heat.

A chimney? If you're strictly a charcoal cook, you won't need one, but be sure that the grill you buy has adjustable



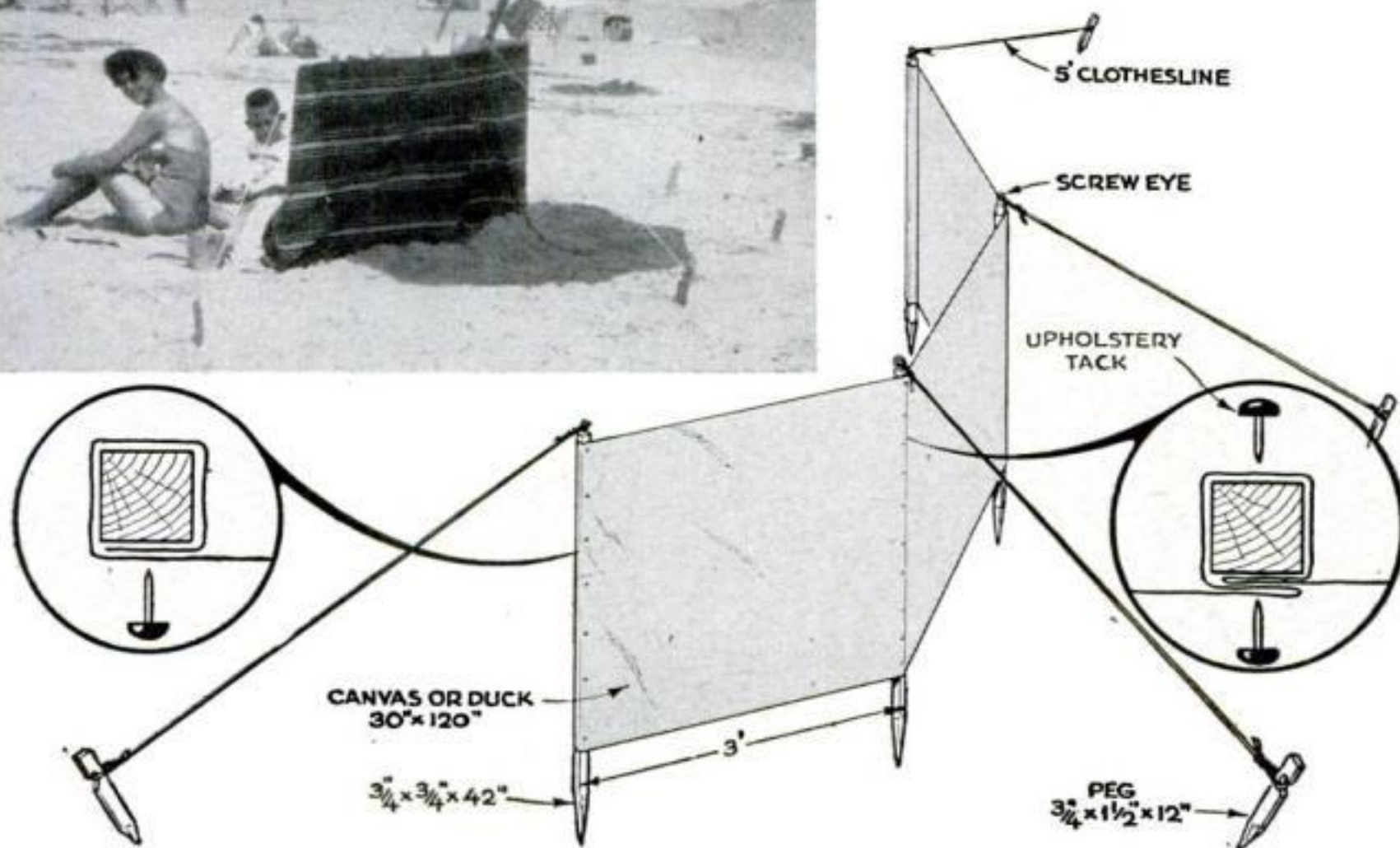
BIG BARBECUE includes storage niches and a special firebox. This one, made by Outdoor Fireplace & Equipment Corp., has a removable crank handle to raise or lower the fire grate.

grates. You need a high grate position for charcoal, a low one for wood. For burning logs, a chimney is usually required to increase draft and channel away the heavier smoke. **END**

More information about barbecue fireboxes can be obtained from: Colonial Fireplace Co., 540 N. Cicero Ave., Chicago 44; Donley Brothers Co., 13902 Miles Ave., Cleveland 5; Homer Foundry Corp., Coldwater, Mich.; Majestic Co., Inc., 115 Erie St., Huntington, Ind.; Outdoor Fireplace & Equipment Corp., 347 Monroe Ave., Kenilworth, N. J.; Outdoor Oven Fireplace Co., 872 Windsor St., Hartford 1, Conn.



Beach Windbreak Is Made of Canvas

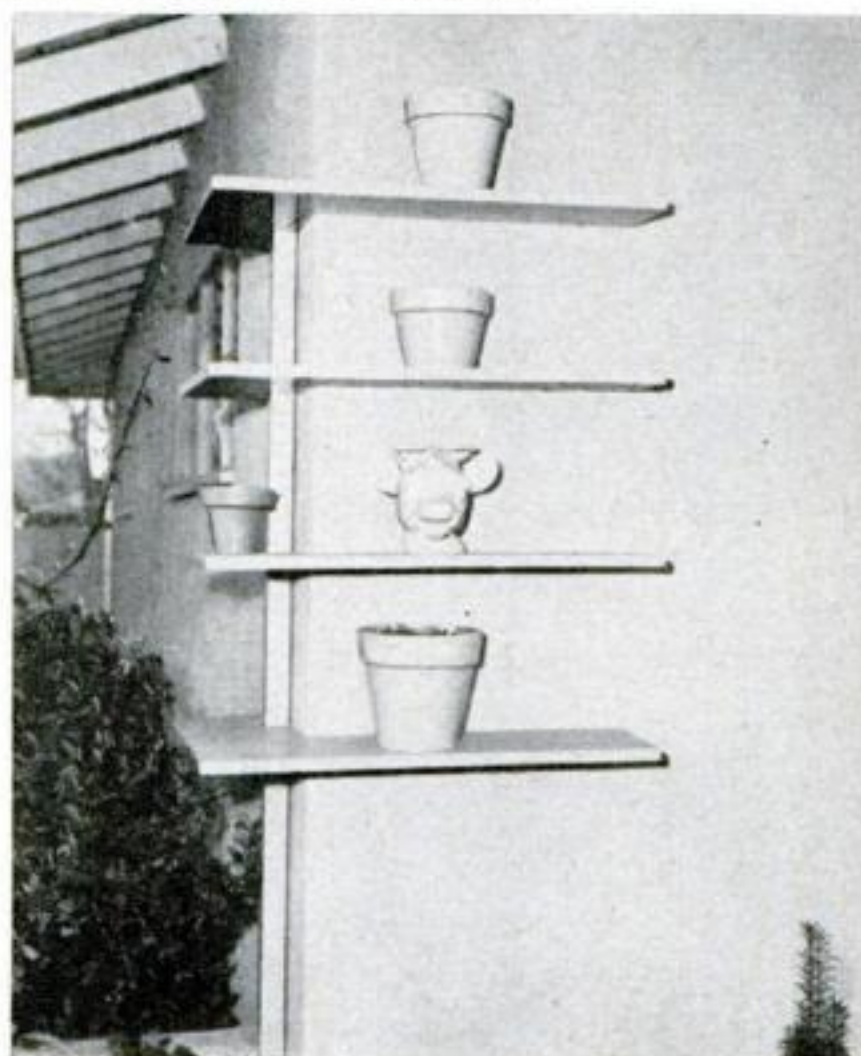
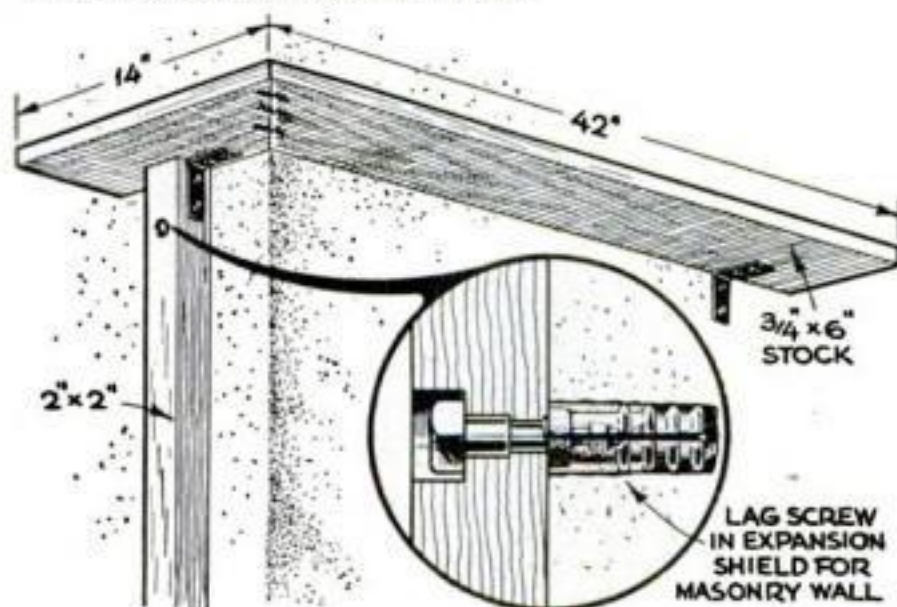


SAND will not beat against your sunburn or get into the food when you take a canvas windbreak to the beach. Mine is a 9' length of 30" awning canvas tacked to four stakes. Four pieces of

light clothesline, running from screw eyes at the top of the stakes to notched pegs driven into the sand, anchor the shield. I sanded and shellacked the stakes and pegs.—*John G. Voelker, Towson, Md.*

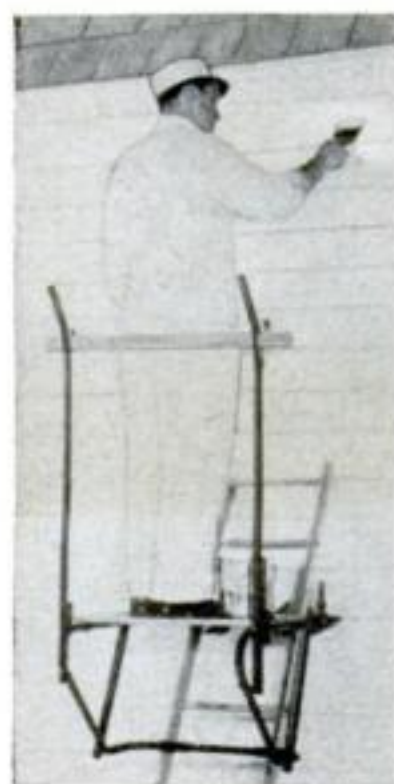
Bric-a-brac Shelves Dress Up Outside Corner of Garage

A BARE corner of your house or garage will take on interest if you add shelves like those at right to hold potted plants and bric-a-brac. Attach a vertical support to one wall with spikes (or lag screws, using a star drill, if it is masonry) and hang shelves from it with angle brackets. Use spikes or brackets also to hold the shelves to the other wall.



New for the Handyman

1. Drain Is Connected Quickly. Light-weight plastic pipe for house-to-septic-tank connections and other drainage jobs is installed quickly with brushed-on cement and a special coupling. The pipe can be cut with a saw. It comes in 10' lengths and 2" to 6" diameters. A dividing ridge on the inside of the coupling helps you to center the pipe in the joint for a permanent seal.



2. Scaffold Fits on Ladder. This aluminum scaffold, attached to a ladder, gives you an elevated platform for house painting. Non-slip clamps grip the ladder, and a guard rail keeps you from backing off. The unit can also be set on a window sill. It is capable of supporting a heavy weight.



4. Scribe Marks Linoleum. This scribe—a metal support holding a marking crayon—walks around obstructions so that you can accurately measure and trim new floor covering. It adjusts for drawing circles from 1" to 25" in diameter.

3. Kit Starts Garden Machines. Any tractor, lawn mower or other equipment with a 1- to 12-hp. air-cooled engine can be converted to electric self-starting with a new unit. The kit includes a six-volt battery, starting motor, switch and necessary parts for quick installation.

More information about the products described on this page can be obtained from: 1. Carlon Products Corp., 10225 Meech Ave., Cleveland 5; 2. Portable Scaffold Co., 342 Taylor Ave., S. Hackensack, N.J.; 3. Chief Industries, Dowagiac, Mich.; 4. Charles Machine Co., P.O. Box 63-131, Springfield, N.J.; 5. Max Salisbury Mfg. Co., 2036 Reidmiller Ave., Fort Wayne, Ind.

5. Bracket Holds Screens. With this hook-on bracket you can use your ladder as an easel for painting or repairing screens and windows. The metal device has two fingers that grip a ladder step.





SWING

Play Equipment That You Can Build

By Charles and Marion Schroeder

HERE'S a sturdy set of back-yard play equipment scaled for little folk from the toddler age up through early school years. Each piece is low enough to minimize danger from falls. Any of them may be taken indoors and used in a basement or playroom on rainy days, or when winter comes. Last, but not least, you can build this jungle gym, slide, swing and sandbox for substantially less than the price of a store-bought outfit. The following three pages show how to make the set.



SANDBOX

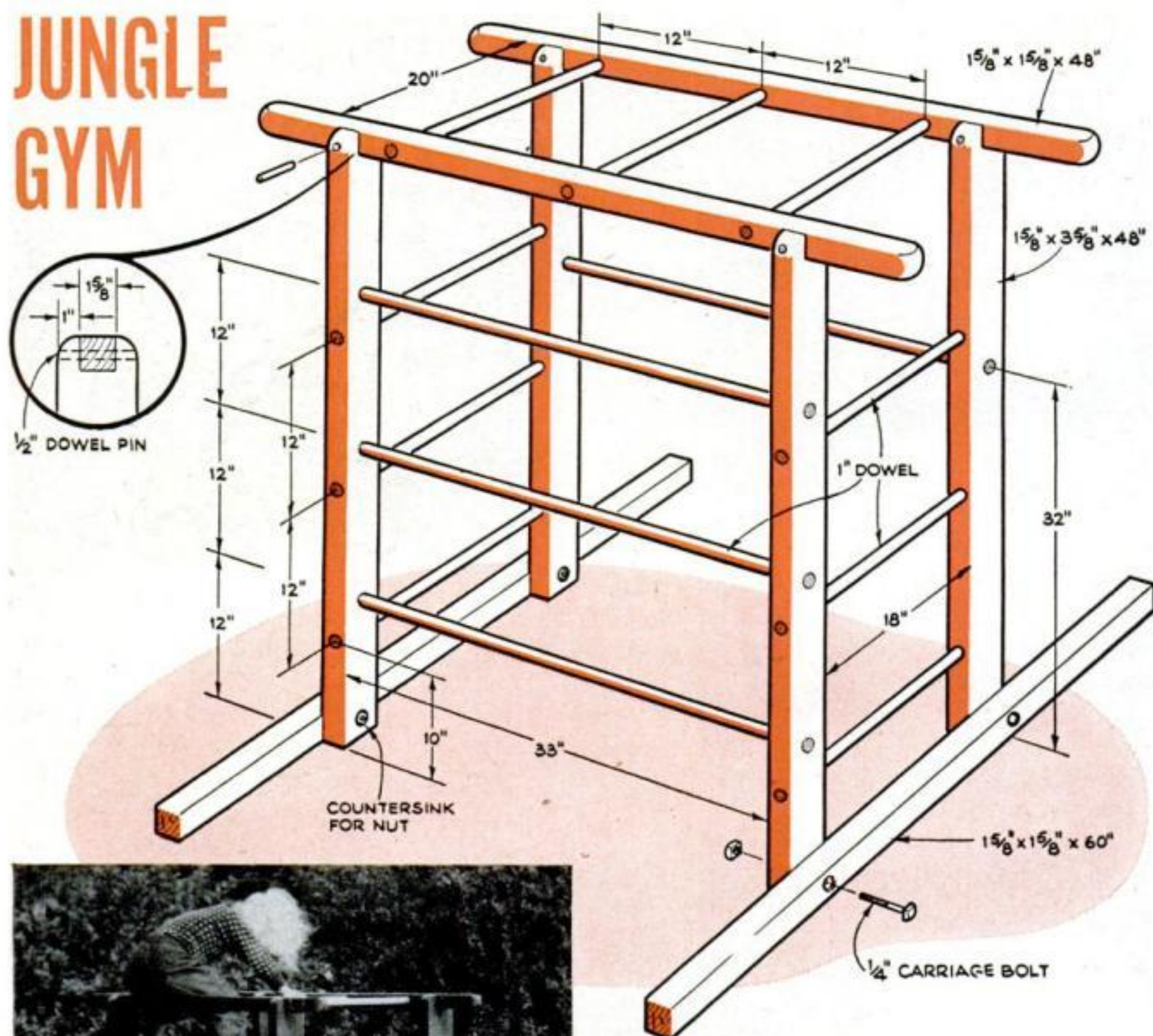
JUNGLE GYM



SLIDE



JUNGLE GYM



ALWAYS a favorite with youngsters, the jungle gym is a good project to start with. Since most of the construction consists of boring holes and fitting dowels, a drill press is a big help here. If you use a brace and bit, take care to make all of the holes perpendicular.

Use two-by-fours for the uprights, two-by-twos for the top stringers and bottom

braces, and 1" dowels for the rungs (dimensions shown in the drawing are actual dressed sizes). Cut notches in the upper ends of the uprights to receive the stringers, and round off the corners of the stock on either side of each notch. Also, bevel or round off the ends of the stringers as a safety precaution.

Rungs. Spot hole locations on the uprights and stringers and, in all cases, drill completely through the stock. Next, insert the dowels in the holes and force the assembly together, checking for final dimensions before cutting off excess doweeling that projects beyond the framing. Use glue and finishing nails to anchor the dowels in place.

The two braces that broaden the base should be attached to the uprights with bolts, so that you can remove them when you carry the equipment indoors.

SLIDE

TREAD-TYPE steps make it easy for the smallest tots to climb to the top of this midget slide.

Cut all of the steps and frame members from 1"-by-3" stock, rounding ends and corners with a jigsaw, as shown in the drawing. Note, too, that the sides of the slide have a slight curve along their bottom edges, starting a foot back from their lower ends.

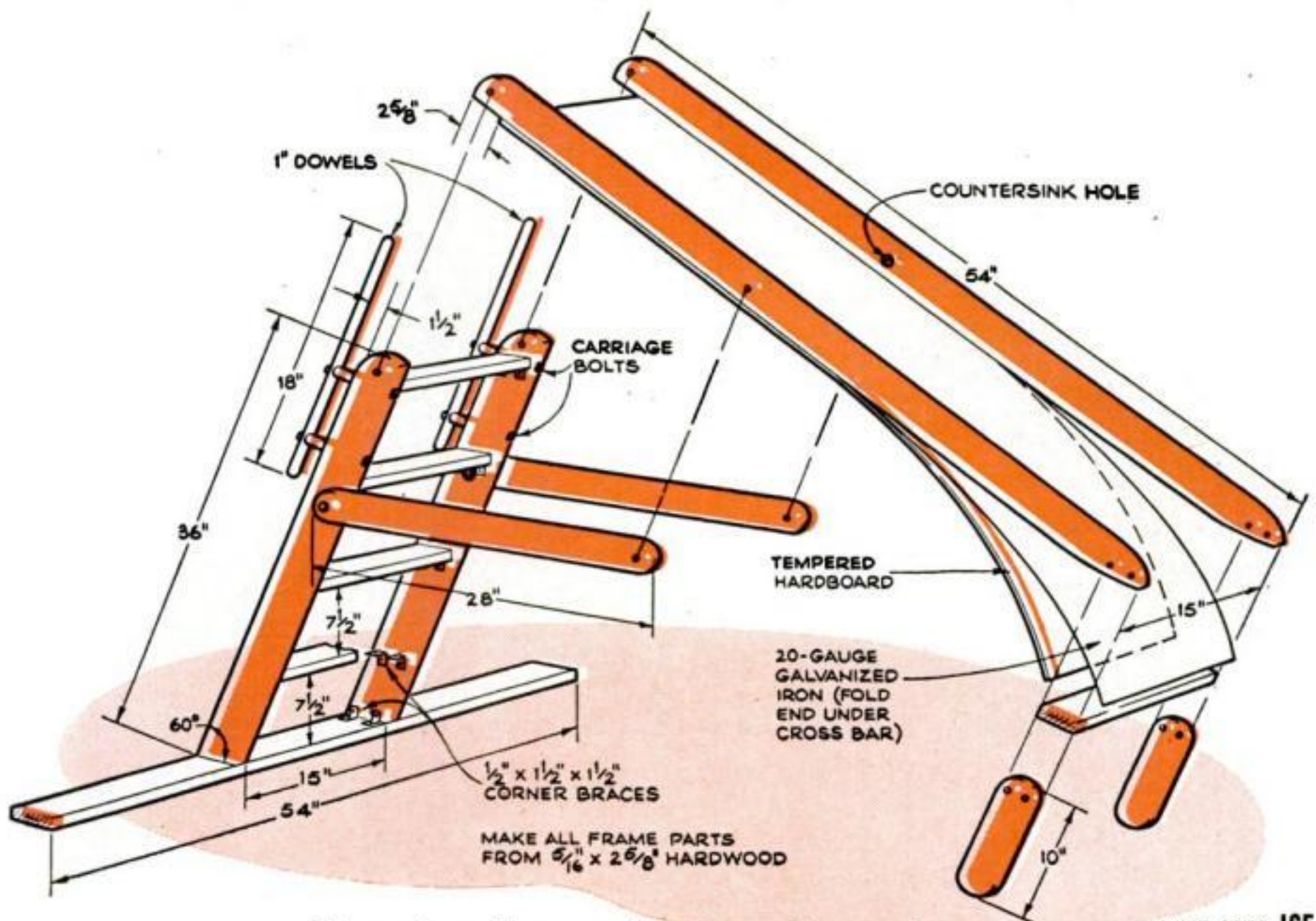
Start the assembly by fastening the four steps and the long bottom brace to the side members with $1\frac{1}{2}$ "-by- $1\frac{1}{2}$ "-by- $\frac{1}{2}$ " corner braces. Make the handrails and the spacers that hold them away from the side members from lengths of 1" doweling. Use a jigsaw to round one end of each spacer inward for a snug fit with the rail. Drill through the rails, spacers and side members for $\frac{1}{4}$ " carriage bolts.

Making the slide. Nail a 6' strip of 20-gauge galvanized metal, backed by a 54" strip of tempered hardboard, to the bottom edges of the side frames, placing the metal so that it extends 3" beyond



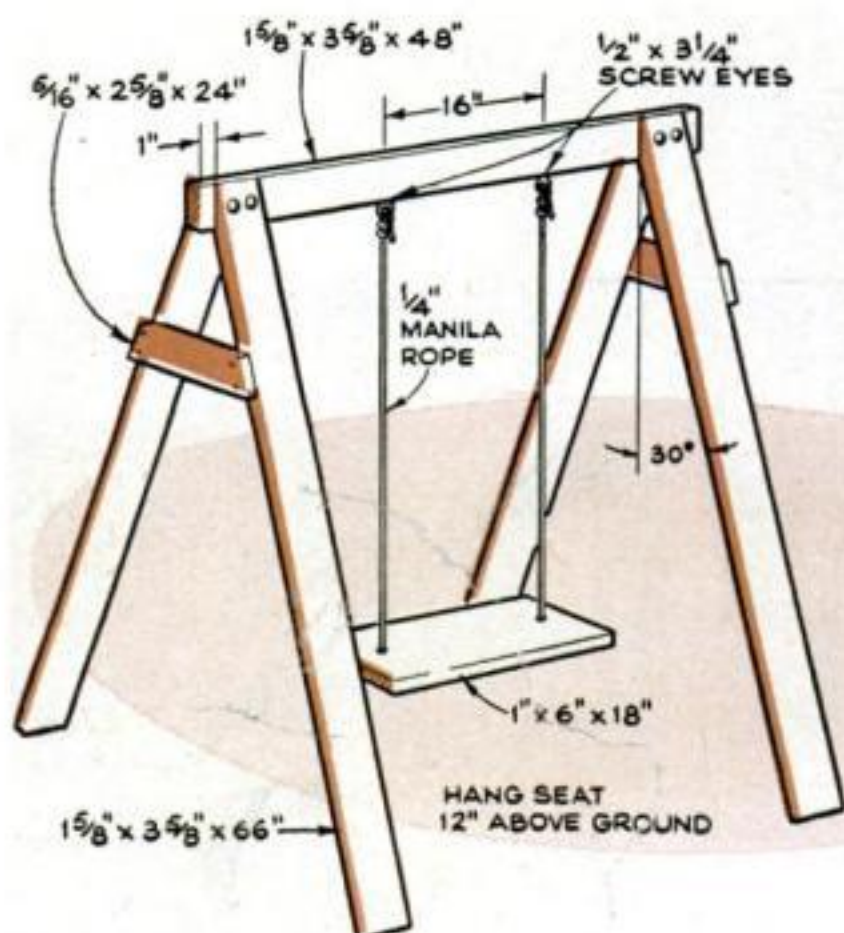
each end of the hardboard. Then screw a cross brace under each slide end. Fold the excess metal down and under these braces and nail to the undersides.

Attach the slide to the ladder section with $\frac{1}{4}$ " carriage bolts. Countersink the holes for these bolts so that the nuts can be recessed and covered over with wood putty. Use the same method to attach the side braces and legs.



Please turn the page for more play equipment

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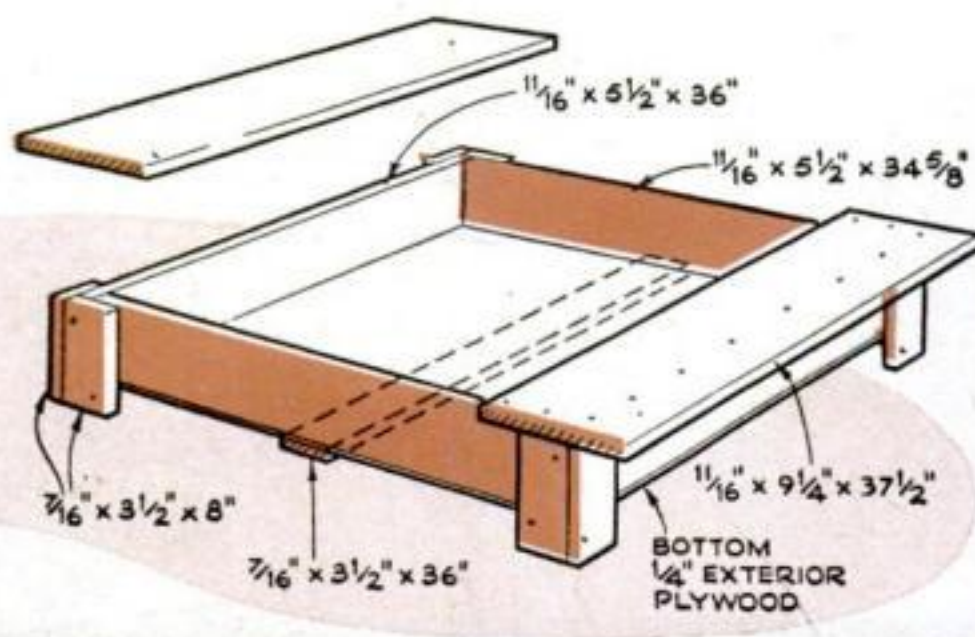


SWING

SAWHORSE construction makes a sturdy gantry for either a store-bought "safety seat" swing or, if you prefer, a plain, old-fashioned board drilled at both ends for a length of manila rope.

Saw off one end of each of the two-by-

four uprights at a 30° angle and bore holes for the carriage bolts that fasten the uprights to the two-by-four crossbar. Screw supports to the outer edges of the uprights, and trim them flush with the sloping faces of these uprights. Attach a pair of screw eyes to the underside of the crossbar and hang the swing. If you use rope, check the knots frequently.

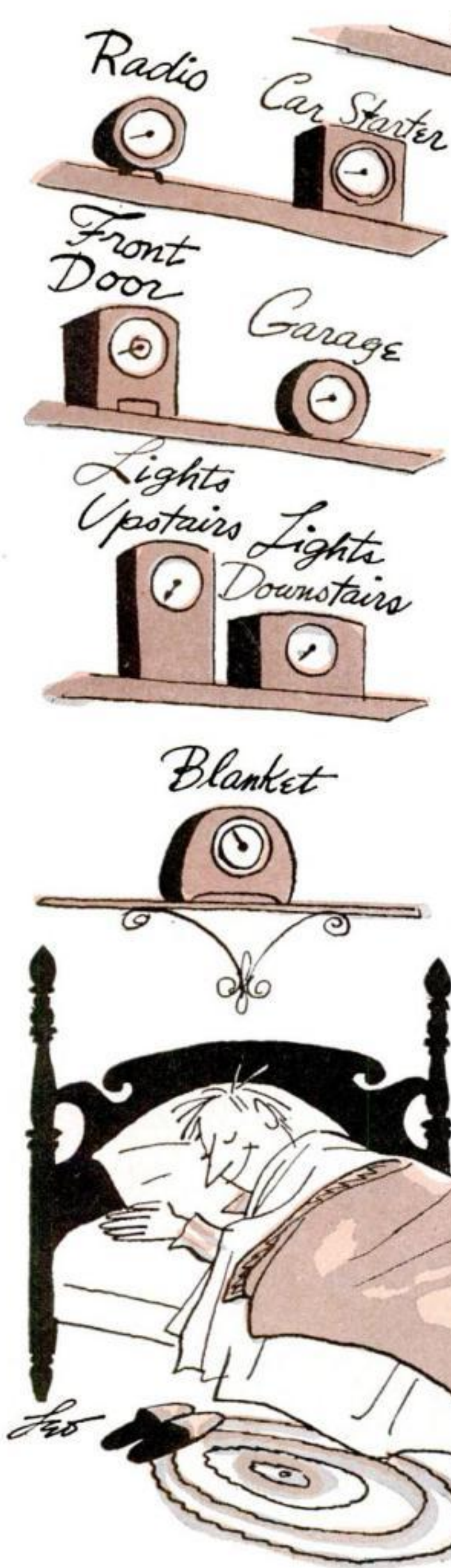


SANDBOX

SEATS on this sandbox double as convenient shelf-like play surfaces. Make the box sides out of 1"-by-6" stock and attach them with 1 1/2" wood screws. Use 1/4" exterior plywood for the floor. After nailing it to the under edges of side pieces, reinforce it with an under-

lying strip of 1"-by-4" stock screwed to opposite sides of the sandbox.

L-shaped legs, each made from two sections of 1"-by-4", hold the box off the ground, reinforce the corners, and support the seats. Attach the legs with countersunk wood screws, covered with wood putty so that they won't rust. Finally, set on the seat boards, again using countersunk screws and wood putty. **END**



Now Automation Can Run Your House

WHEN you wire up your electrical devices with time switches, you don't even have to push buttons. They push themselves. That's automation brought right into your home.

Lights that go on at dusk, air conditioners that begin to banish the heat an hour before you come home, coffee that starts to perk just before your time-switched radio croons you awake—things like these can make life considerably smoother.

For a hopeful burglar with a larcenous eye on your house, they can make life intolerable.

If he comes prowling while you're away, he'll see the living-room lights shine on at dusk. A few minutes later the post lamp



MUSIC AND FLASHING LIGHTS prowler-proof your home while you rest peacefully in the country.

lights up. Maybe for a while there's a snatch of radio music.

The prowler goes away. If he returns later, he may be just in time to see the ground floor go dark—and seconds later a light go on in an upstairs room. As he scurries for cover, he never guesses that the "occupants" are only a few inexpensive time switches.

Box with a memory. A time switch is simply an electric clock combined with an electric switch. A number of companies make them. The simpler types are sold by department and appliance stores, while the more complex switches are available from hardware and electrical-supply dealers and mail-order firms.

As a portable unit for home use, a time switch is a fist-size plastic case that has a receptacle into which you can plug any small appliance. The appliance will

go on at any hour that you choose, then off again at any other hour. The timer will repeat this cycle day after day, whether you're around or not. You can buy one for about \$10.

A slightly more elaborate variety has manual switches as well, for times when you want to take over yourself. A typical model has four manual positions—temporary on, temporary off, permanent on and permanent off. With the temporary positions, you can interrupt the cycle for a short period, and it will go back on automatic at the next time setting. The permanent positions give you manual control indefinitely.

Also made in attractive plastic models are timers that are electric clocks, too. One type has an additional feature—a buzzer that goes on from one minute to four hours after you set it. It's handy for timing eggs, pressure canning and photographic work. A simplified timer, made especially for defrosting a refrigerator, will turn it off just long enough for the ice to melt.

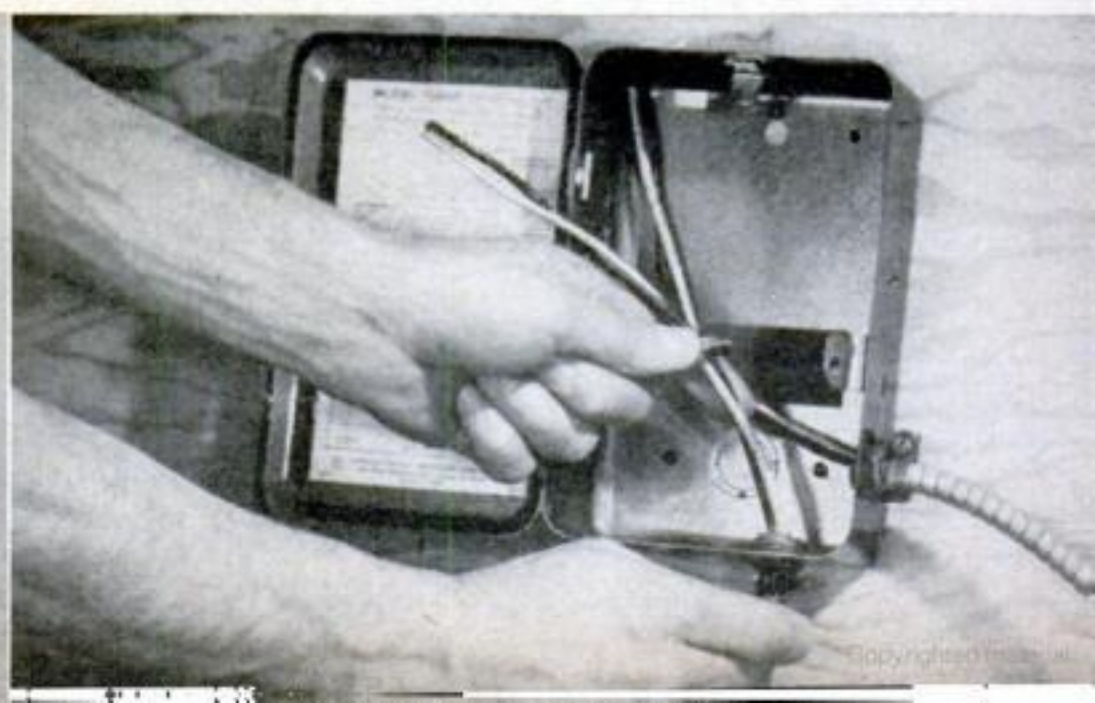
Heavy-duty jobs. The fancy-finished portable time switches are limited to average plug-in appliance loads, the highest of which is 1,650 watts. But you may have a bigger load to handle—say an electric radiator or a hot-water heater for a vacation cabin.

For these, you can get husky, high-capacity time switches that come in plain metal boxes and are designed for perma-

You can install a permanent time switch in four easy steps

TIMER CONTROL lifts out of metal housing so that you can screw box to wall and wire it up easily. In this International Register model, simple spring clips release the mechanism.

TWO CABLES, one from the power source and one to the appliance, are led into box through knock-out openings. Use same type and size of cable that is used in the other house wiring.



ment mounting in a garage, basement or other out-of-the-way place. Most of these require permanent wiring, but cost little more. You can get one for \$10.95 that will handle a one-horsepower motor or any appliance up to 4,000 watts.

If you use that cabin only on weekends, you can get a special skip switch that will turn on the water heater before you get there on Saturday and turn it off after you leave Sunday, skipping the other five days. For more elaborate control, there's a calendar switch with a seven-section dial on which you can set the times for every day in the week separately. Another model lets you change your mind as many as 96 times a day. It is also made with Sunday and holiday cutouts.

Automatic living. Here's how a typical day might go—if you had a brother-in-law who owned a time-switch factory. (Even without that brother-in-law, a few switches in the right places can help



A BRIGHT WELCOME is insured by garage and post lights that go on before you get home.

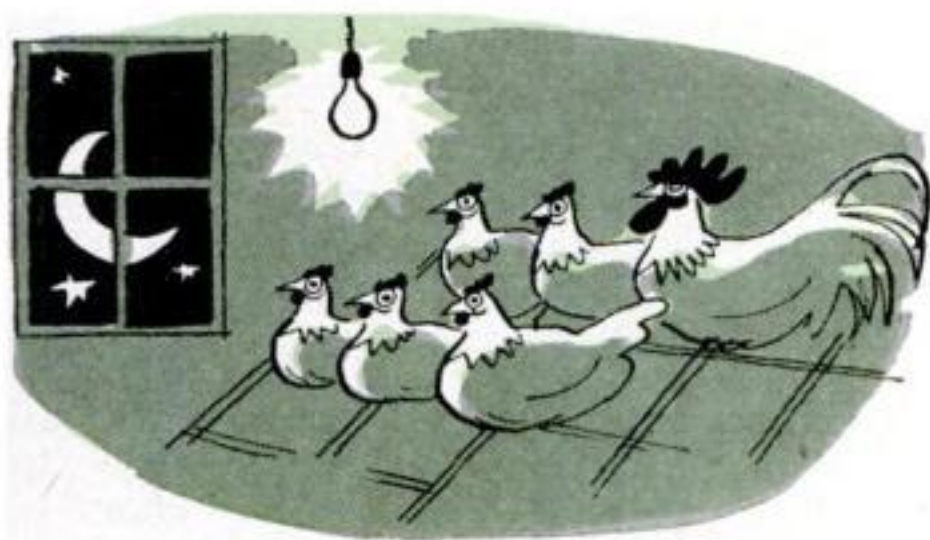
you do many jobs that you can't do yourself, or might not remember to do.)

To wake you in the morning, a time switch converts your ordinary radio to a sweet-whispering alarm clock. Another one makes sure that you won't forget to turn off the electric blanket.

Meanwhile, a switch in the kitchen has started a coffee maker, and another one has turned on an electric heater in the bathroom to prewarm it for shaving. If your furnace has a manual thermostat, a switch can make it automatic. Or if you already have a clock type, an extra timer hooked into the circuit will cut out its automatic operation for periods up to a week when you're going to be away.

Your car starts instantly because your electric engine warmer—perhaps just a couple of heat lamps directed at the oil pan—has gone on an hour before.

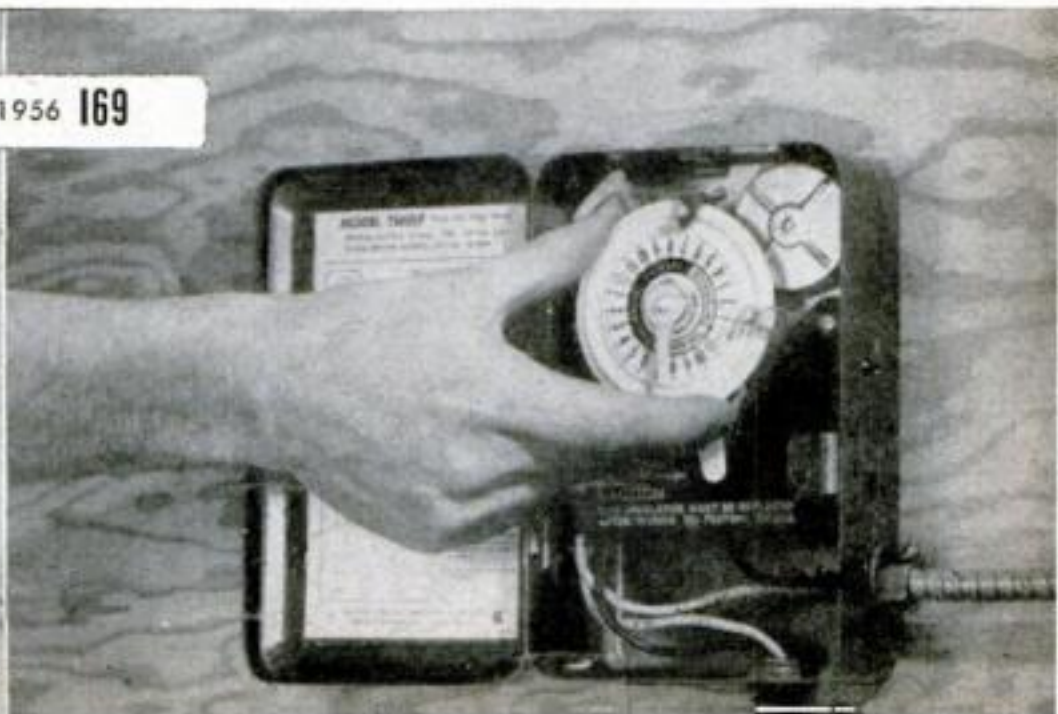
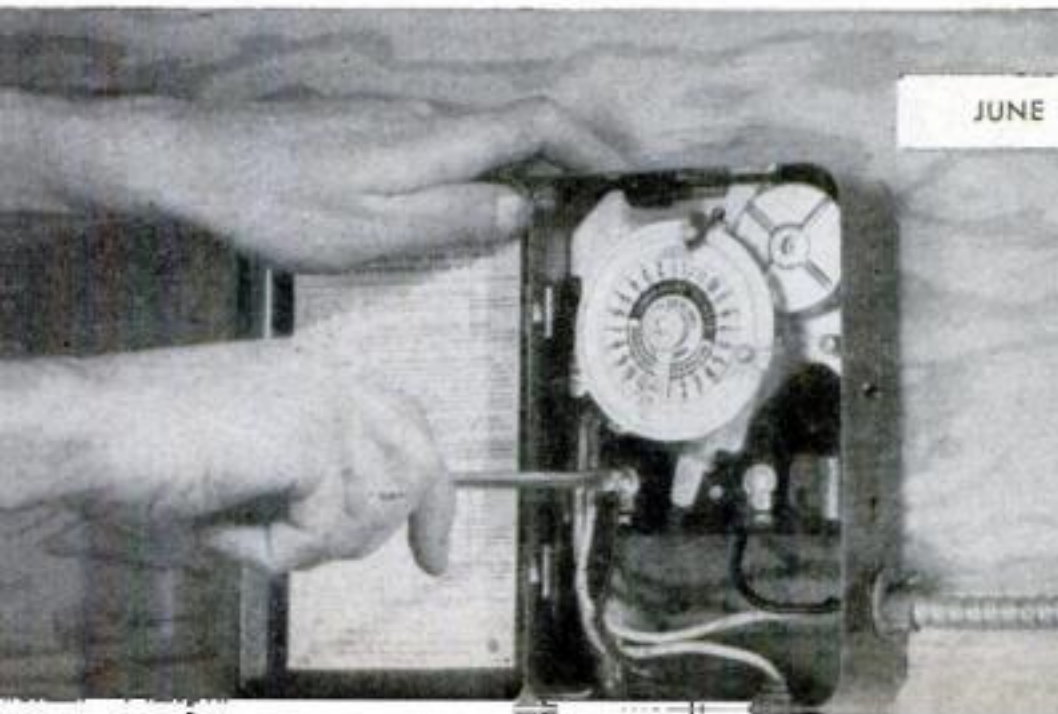
You arrive at work to find the place already warmed by a timer-controlled heater—or aired by a fan or cooled by an air conditioner. Night lights have shut

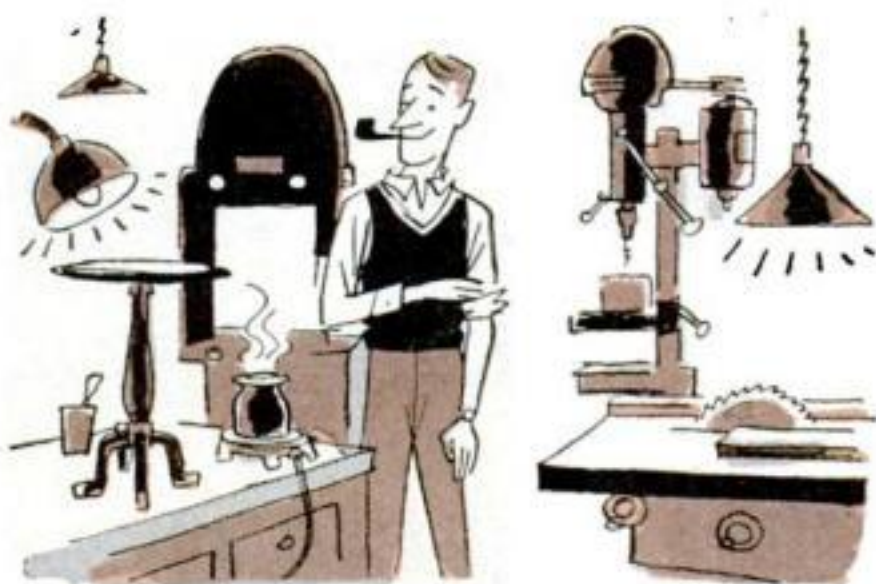


HENS GO ON THE NIGHT SHIFT as timer-controlled "daylight" coaxes extra egg production.

ONLY THREE CONNECTIONS are made after timer mechanism is slipped back into housing. Black leads are fastened to terminals marked "line" and "load," and white ones go to a common post.

TO SET SWITCH, you start the clock and turn the dial to present time of day. Two pointers around edge of the dial are then set at the hours that you want the switch to go on and off.





SHOPWORK SPEEDS UP with a prewarmed glue pot, heat lamps that go out after you're in bed.

themselves off, while any showcase or window-display lights have gone on.

Around-the-clock comfort. At home, time switches are still at work. Your wife, off on an afternoon call, plugs the electric roaster into a timer so that dinner will be hot and ready when you both arrive home.

Portable heaters prewarm the playroom in time for the kids when they get

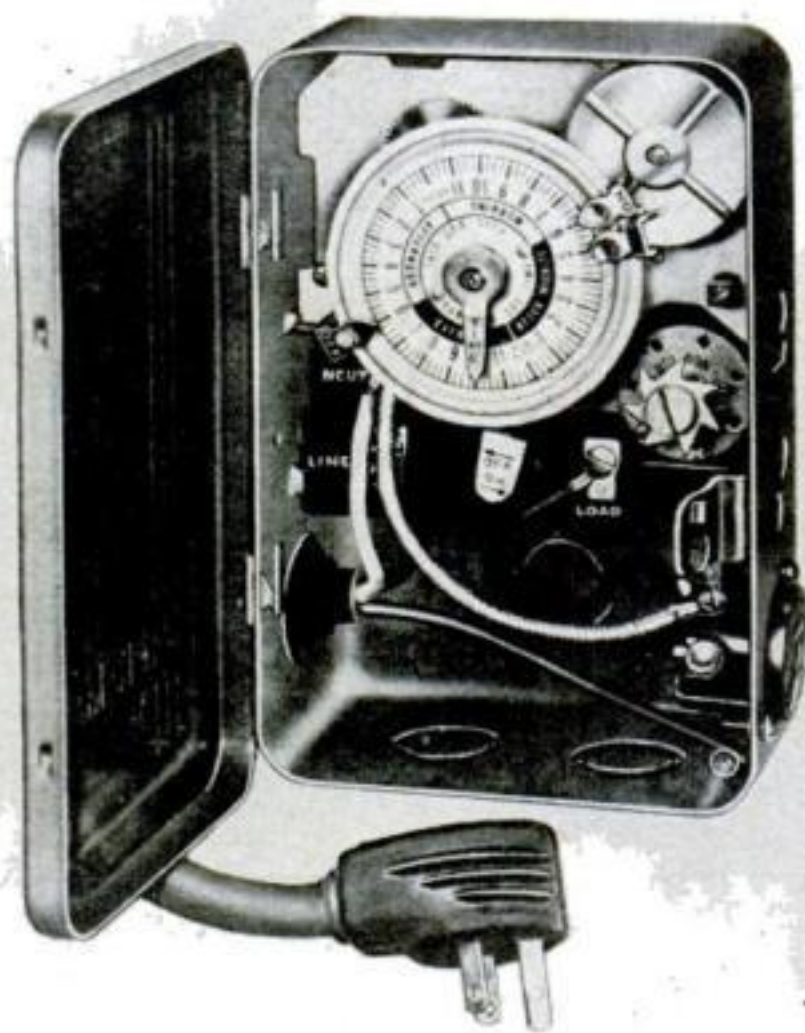
home from school, then switch on and off every 15 minutes or so to produce the desired temperature without requiring a thermostat. No danger that anyone will bake under a heat or sun lamp, either—it shuts off by itself.

Evening chores. When you arrive home at night, your garage light is already on—and will shut itself off later without your remembering to. Later, your TV set pops on because you've set it so that the kids won't miss their favorite program. You've also set it to go off at bedtime—kids can't argue with a time switch.

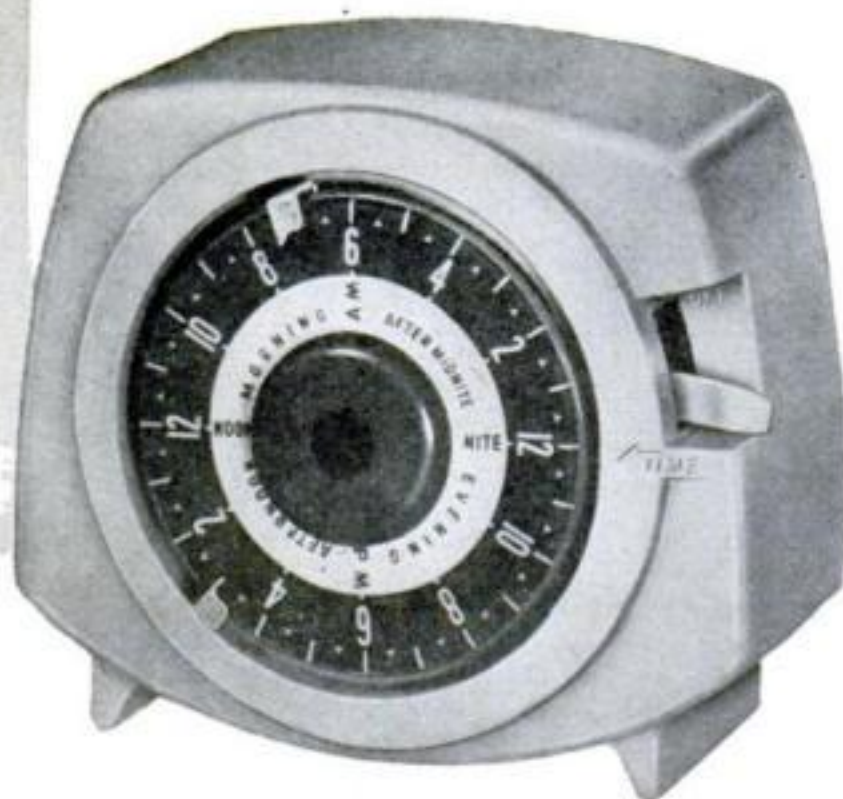
When they're all tucked in and watered down, you "cheat." You flip over the manual switch and watch your own TV programs. When you leave your workshop, another time switch takes over to give the glue joint or paint job just the right number of hours under heat lamps for a quicker drying.

At bedtime, off goes the porch light and on goes the electric blanket. On warm nights you switch the fan to go off after you've fallen asleep.

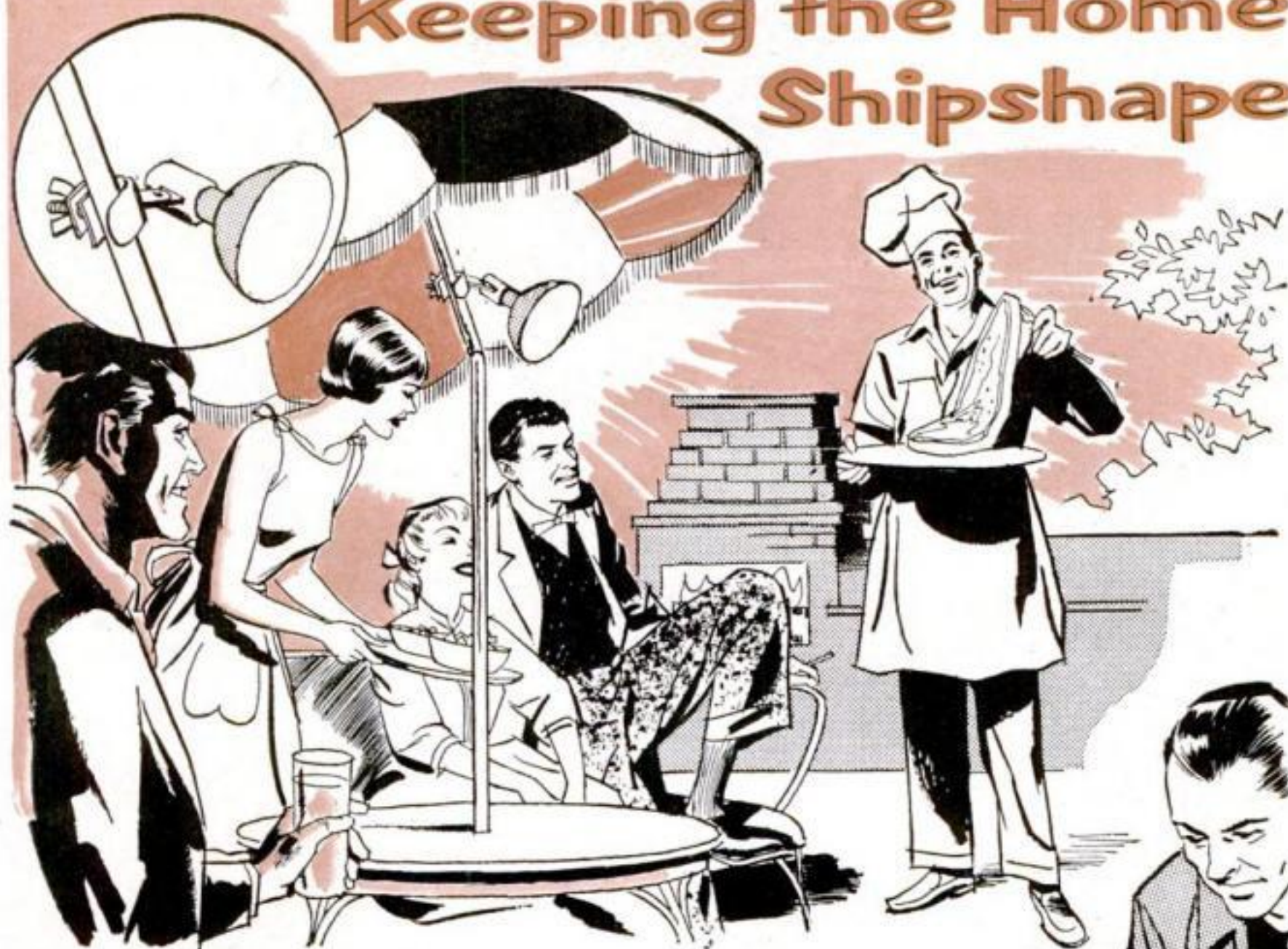
If you're a farmer, timers control your water pumps, electric fences, ventilating fans and other devices that operate at set intervals throughout the day and night. Your hens are working overtime under lights that are turned on and off by a special timer which even provides a dimmer period of 20 minutes so the chickens can roost safely.—*Darrell Huff.*



PLAIN OR FANCY. Plug-and-socket timer above handles large appliances without requiring permanent wiring. Plastic-cased unit at right is for portable use with small appliances only. Make sure that wattage capacity on timer equals or exceeds that marked on the appliance.



Keeping the Home Shipshape

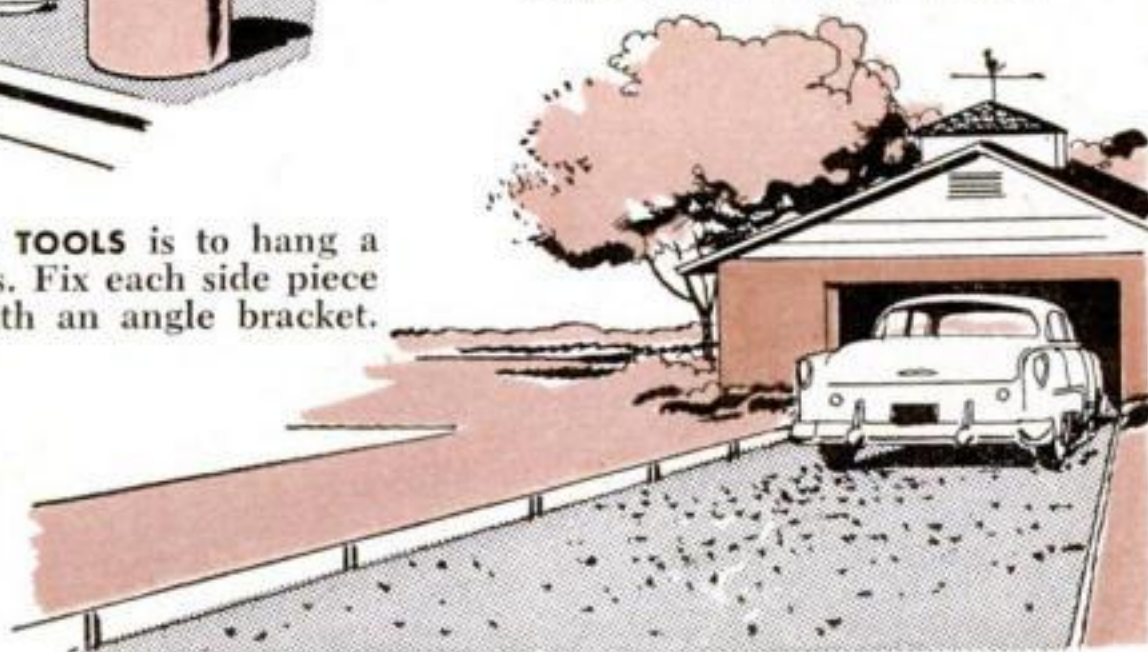


LIGHT UP AN UMBRELLA to enjoy your patio after dark. An outdoor-type spotlight bulb in a clamp-on holder can be fixed to the stem. Use weatherproof sockets and wiring.



A SLICK WAY TO RACK KITCHEN TOOLS is to hang a slotted shelf beneath wall cabinets. Fix each side piece to the underside of a cabinet with an angle bracket.

CRUSHED STONE from a driveway won't flip over onto the lawn if you build a low wall between the two. It can be made of strips of $\frac{1}{4}$ " tempered hardboard staked in the ground every 6' or so.



A HOMEOWNER'S GUIDE is what you get if you file the instruction books for all your appliances in a loose-leaf cover. Add a page to list sizes of small items such as faucet washers and window shades.

Please turn the page for more home tips

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More Home Tips

MARK THE DIAL of your clock radio at your favorite wake-up station with a bit of tape or a dab of nail polish. It's easy to turn to at night after you have heard a program at another spot.



STORING WINTER WOOL-ENS? Old nylon stockings make good moth vaporizers. Fill the feet with moth balls or nuggets and knot the stockings' upper ends over the closet rod.



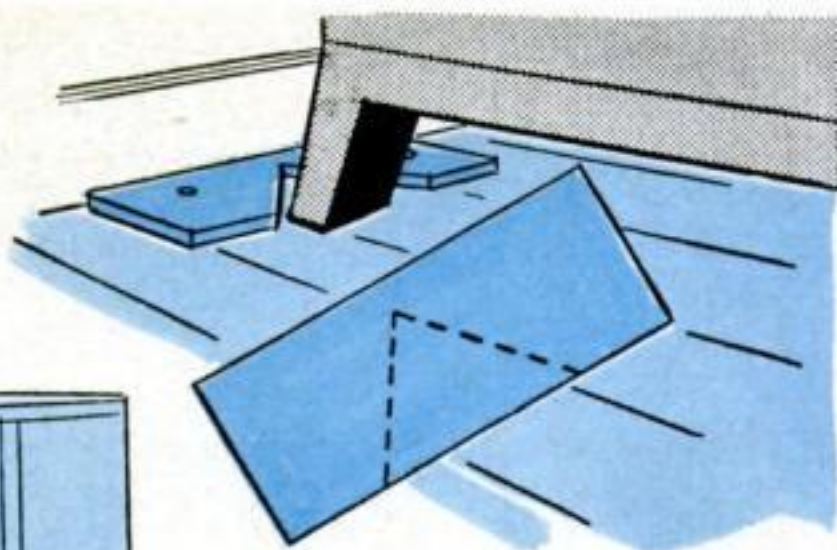
WHEN YOU TILE A BATHROOM order extra tiles. Then you can cover a plywood frame to make a hamper that matches the walls. Leave the back free of tiles and drill some holes in it to allow for ventilation.



EMPTY PEANUT-BUTTER JARS used for refrigerator dishes will look like purchased sets if the screw tops are enameled to match your kitchen walls or cabinets. Also foods in the jars will be easy to identify.



CHECK THE WINDOW—sash, frame, sill and cord—before installing your air conditioner. Glazing, puttying, calking, painting and other necessary window repairs are much more difficult to make after the conditioner is in place, and may even require costly removal and reinstallation.



FURNITURE STOPS will keep sofas and heavy chairs away from walls and picture windows. Cut notches or leg slots in 2"-by-4" rectangles of thin wood and brad them to the floor. Finish to match the floor.

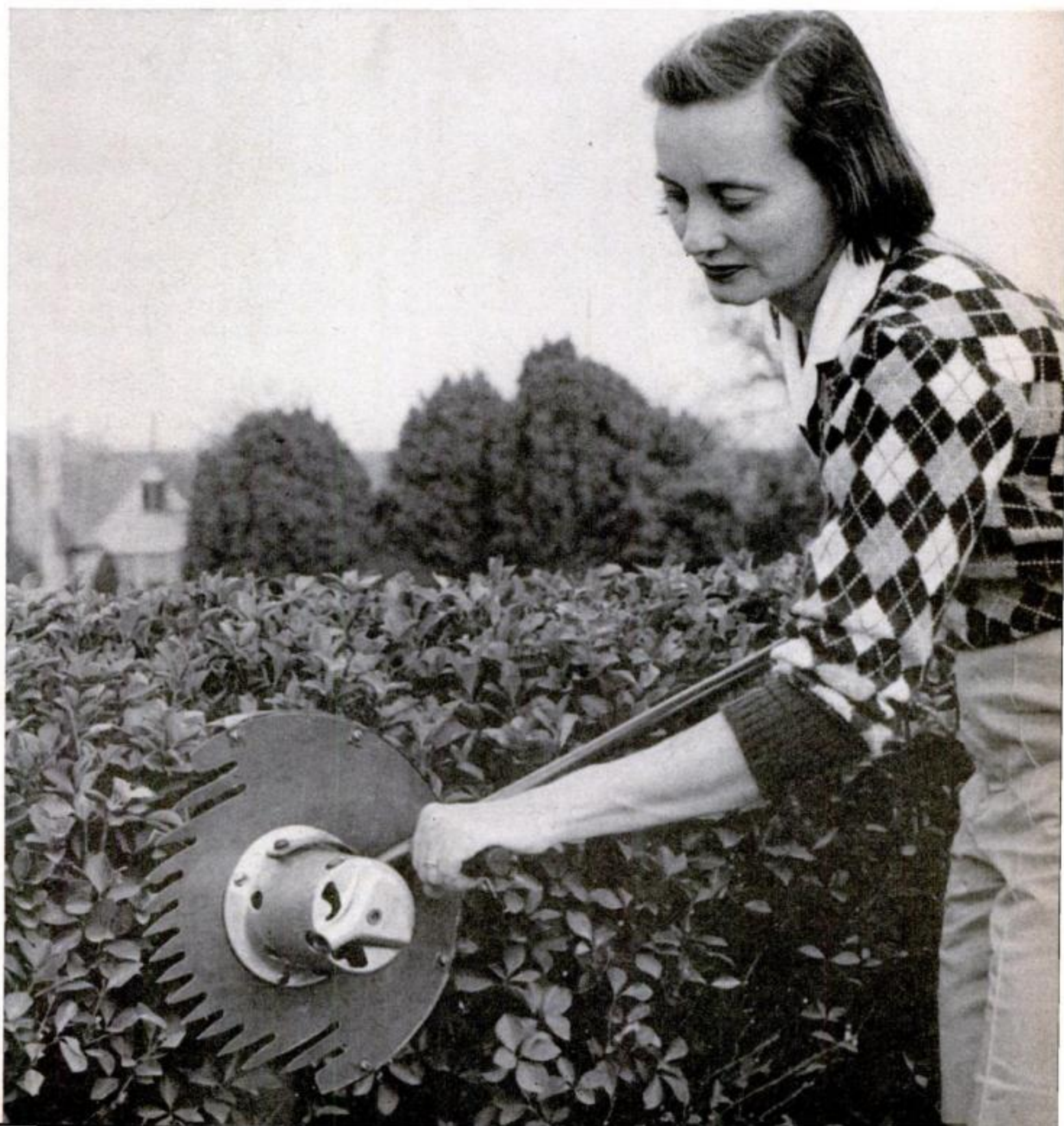
An old vacuum-cleaner motor and a few hours' work let you

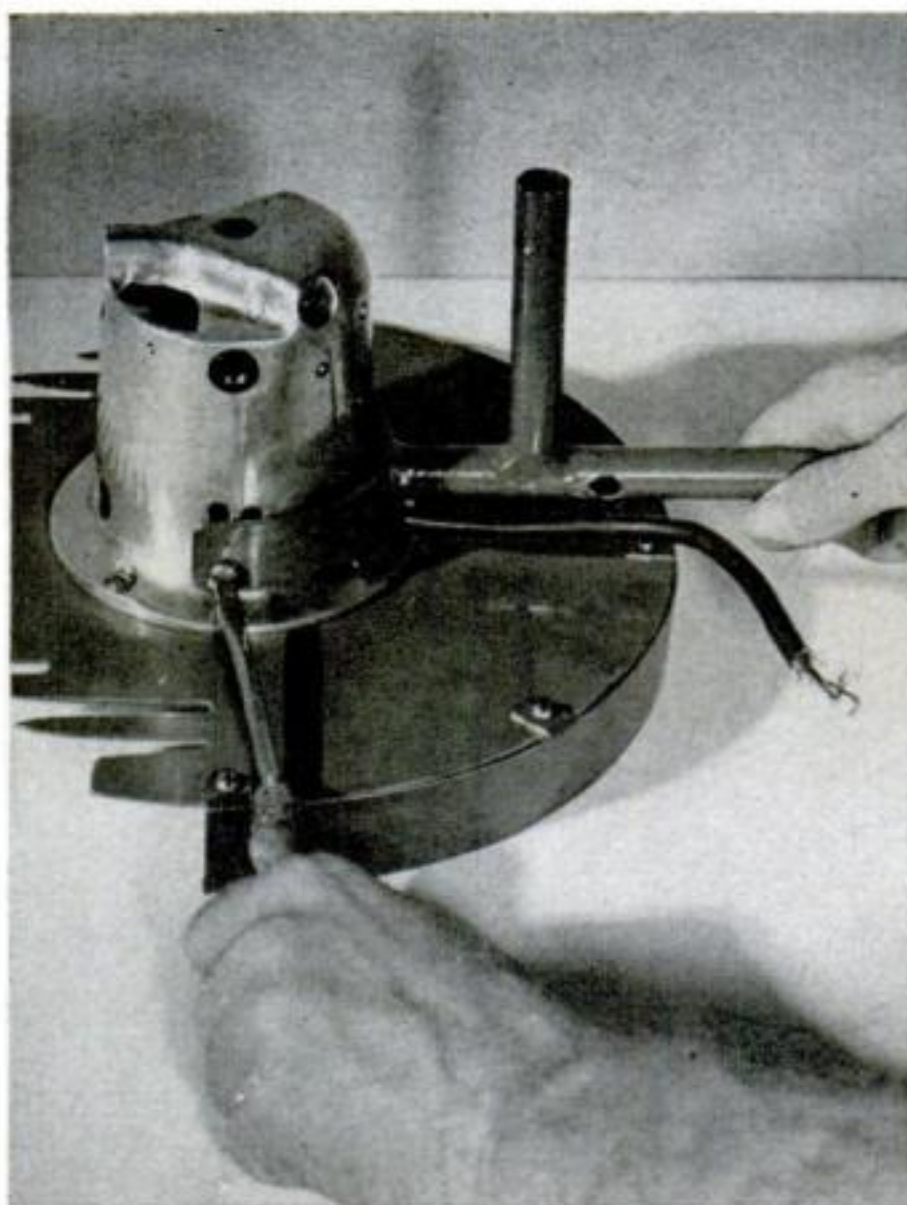
Trim Hedges the Quick Way

By John Rogers

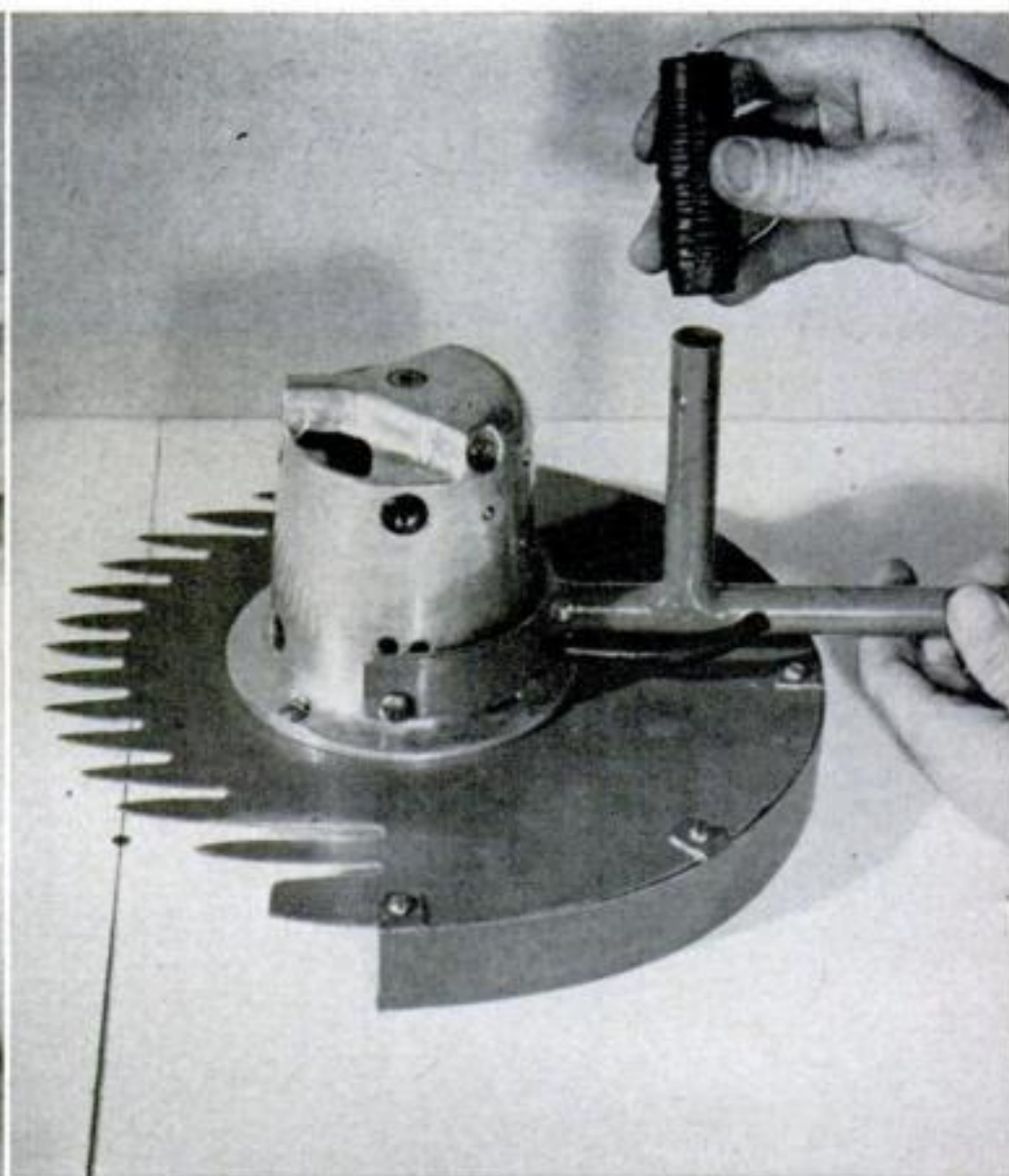
AN OLD vacuum-cleaner motor and a keyhole-saw blade gave me the working parts for a rotary trimmer that does a neat, fast job of clipping

hedges and shaping shrubs. The trimmer has a combination rake and guard that protects the operator from both the whirling blade and the flying cuttings. It also traps the heavier cuttings, giving the blade a chance to mulch them before





HANDLE MOUNTS on this motor from an old Apex vacuum cleaner were made to order for a firm connection with the trimmer's handle—a length of $\frac{3}{4}$ " conduit. The motor's lead cord is threaded through a hole drilled in the yoke.



SMALL HANDLE-BAR GRIPS are fitted over the conduit. A heavy-duty electric cord is threaded through the horizontal pipe from the rear, then drawn out through a hole in the sidewall and the wires spliced onto the motor leads.

they are tossed clear of the housing.

You can build a similar trimmer in a couple of evenings, once you've latched onto a discarded motor of the type used on old upright vacuum cleaners. Most electrical-appliance houses have a few traded-in models of this kind stowed away in the back of the store, so you shouldn't find it hard to get one.

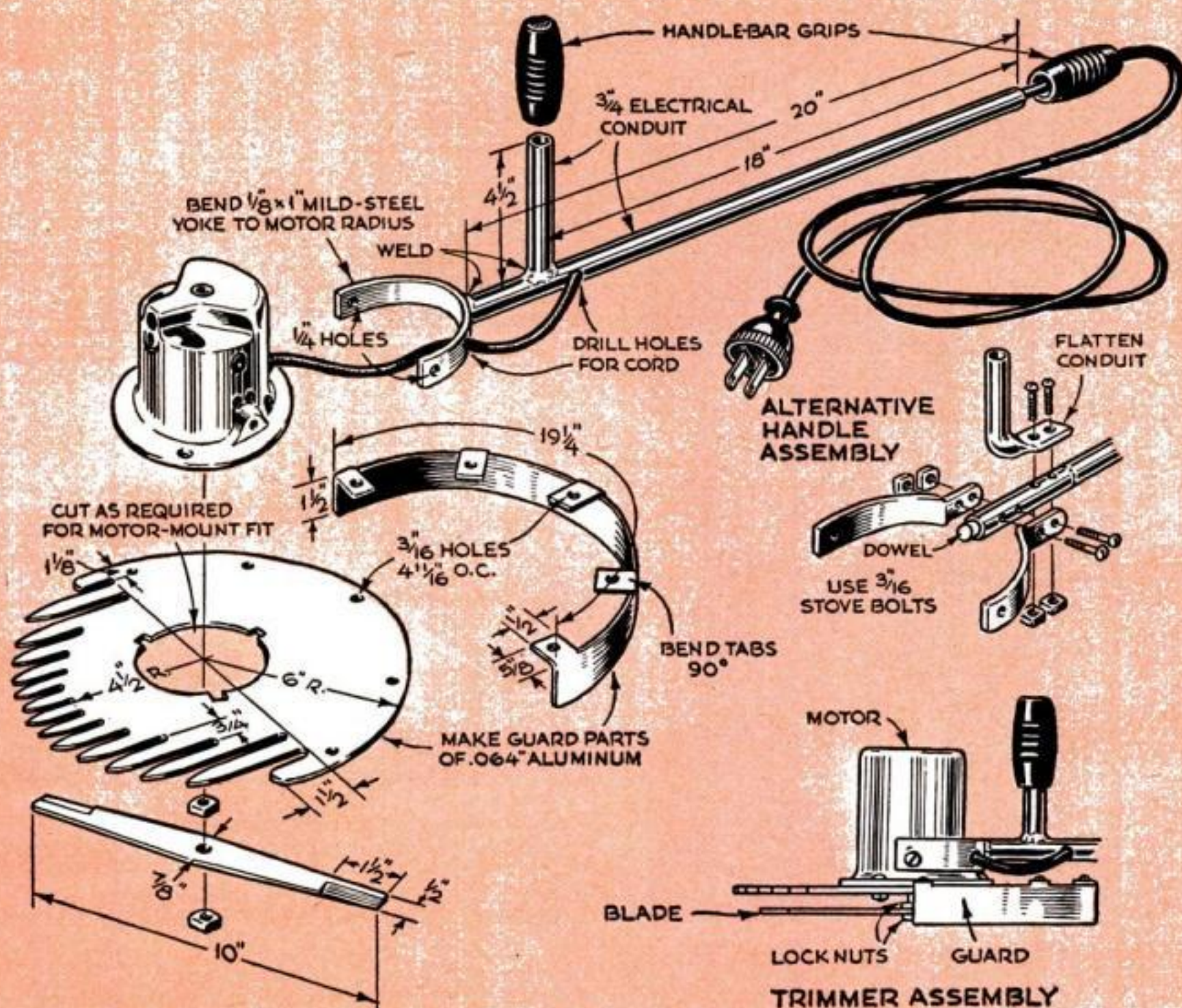
Attaching the handle. The design of your motor may call for slight modifications in the hedge-trimmer plans shown here. Down near the mounting flange and on opposite sides of my motor I found two flat-faced projections drilled and tapped for the vacuum cleaner's handle connection. These gave me convenient mounting points for the handle of my hedge trimmer.

If your motor housing doesn't have such mounts you can substitute a ring-clamp for the trimmer-handle yoke, as shown in one of the drawings. Don't attempt to drill and tap the motor housing

for a bolted connection; there's a close-fitting fan inside the lower section of the housing and the blades are likely to strike any bolt projections.

I welded the three parts of my trimmer handle together. Don't let that throw you. If you don't have a home welder and want to save the expense of having a shop do the job for you, you can assemble the handle parts with stove bolts. If you use bolts, be sure to insert a dowel plug in the forward end of the long handle to reinforce the thin-walled tubing.

Forming the disk rake. Like the trimmer handle, the rake-and-disk section of the guard will have to be tailored to the motor. Most motor housings have a shallow collar at the lower end which fits down into the vacuum-cleaner casting. If yours is this type, cut the hole at the center of the guard just large enough to receive the collar. Otherwise the guard won't fit flush against the motor housing's base flange, and the comparatively thin

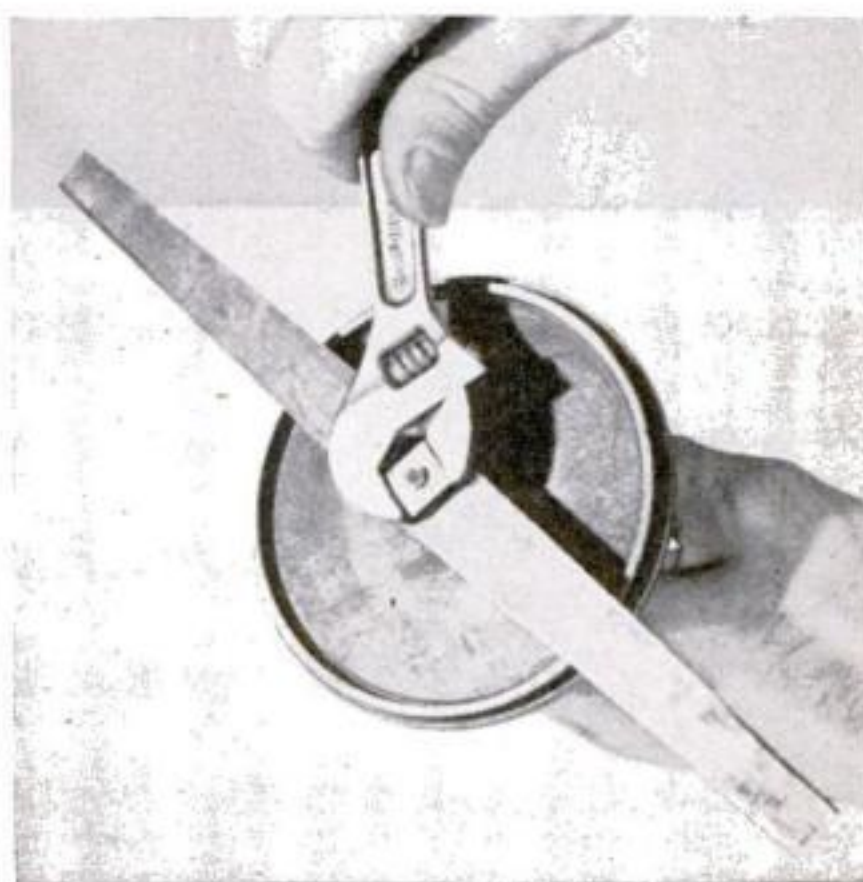


metal will buckle when you tighten up the bolts that fasten the guard in place.

To form the rake, drill $\frac{1}{4}$ " stop holes at $\frac{3}{4}$ " centers before making the parallel cuts for the tines. The only exceptions are the two outer stop holes. As shown in the assembly drawing, they are centered $1\frac{1}{8}$ " in from each guard side.

Shape the edge section of the guard and drill holes in its tabs before drilling mating bolt holes in the disk section. By positioning the edge strip on the periphery of the disk you can spot the second set of holes accurately.

The blade. A dime-store keyhole saw supplies the cutter blade. File or grind it to shape, then bore a hole the diameter of the motor shaft through the center of the blade with a high-speed bit. Bolt the guard to the motor and attach blade to the threaded shaft end with two lock nuts.

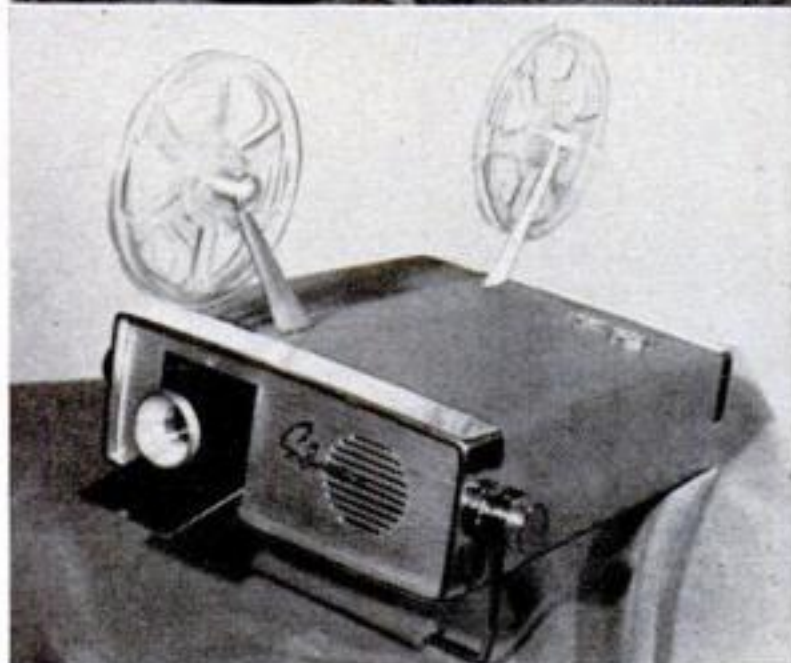
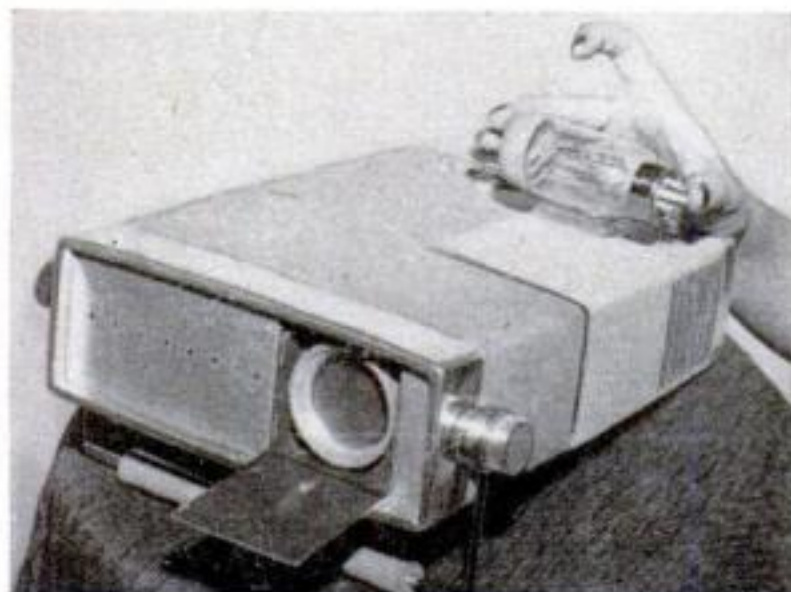


TWO LOCK NUTS, threaded onto the motor shaft, provide a safe mount for the keyhole-saw blade. Some vacuum-cleaner shafts turn counterclockwise—check yours before you file or grind the cutting edges on the blade. **END**

New for Camera Fans



1. Finding F-Stop Easier. You set the lens on this 16-mm. camera by dialing to the description of outdoor light conditions. A three-position button permits normal or continuous runs and single-frame shots.

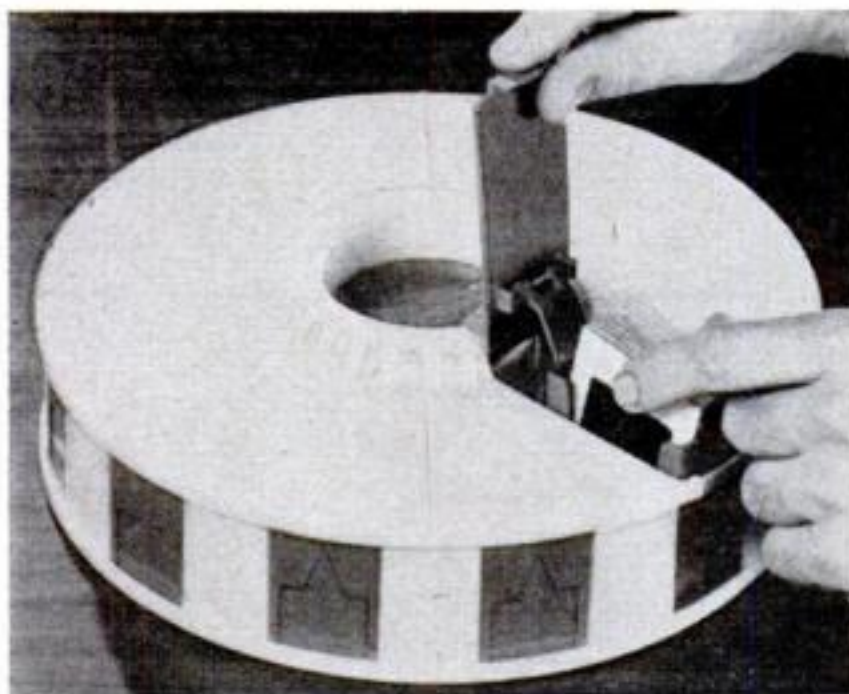


2. Projectors Get New Look. A new lamp that operates horizontally or vertically is causing sharp changes in projector design. Flat slide and movie machines, like the experimental models above, will be made soon by several manufacturers. The new lamp is just 4" long, 2" shorter than conventional types. The socket snaps it into focus.



3. Vest-Pocket Viewers. Made of folding paperboard with ground-glass lenses, the little 3-D and slide viewers above focus by pressing the top and bottom. Each is in a case that will hold several slides. You can get binoculars like them.

More information about these products can be obtained from: 1. Bell & Howell Co., 7100 McCormick Road, Chicago 45; 2. Sylvania Electric Products, Inc., 1740 Broadway, NYC 19; 3. Taylor-Merchant Corp., P.O. Box 52, Cathedral Station, NYC 25; 4. J. & M. Zadiix Products Co., 299 Third Ave., Brooklyn 15.

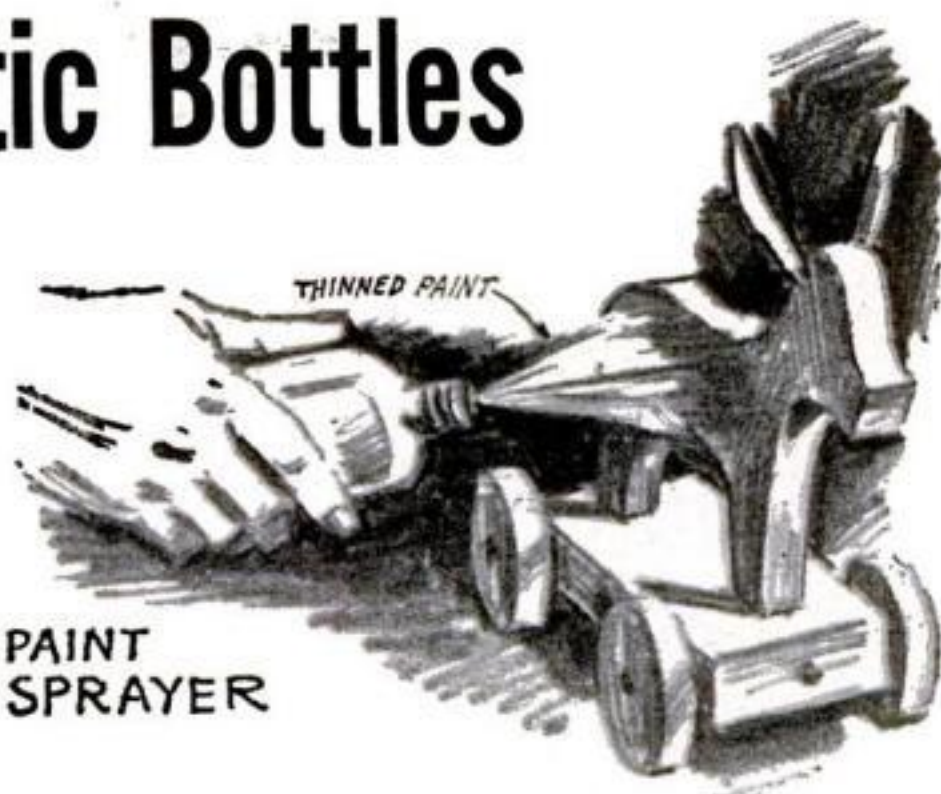


4. Revolving Slide Case. You can locate 35-mm. slides quickly in this circular plastic file case having 12 labeled compartments for 300 slides. Its rotating top has a lifting bar in its opening.

9 USES FOR Plastic Bottles



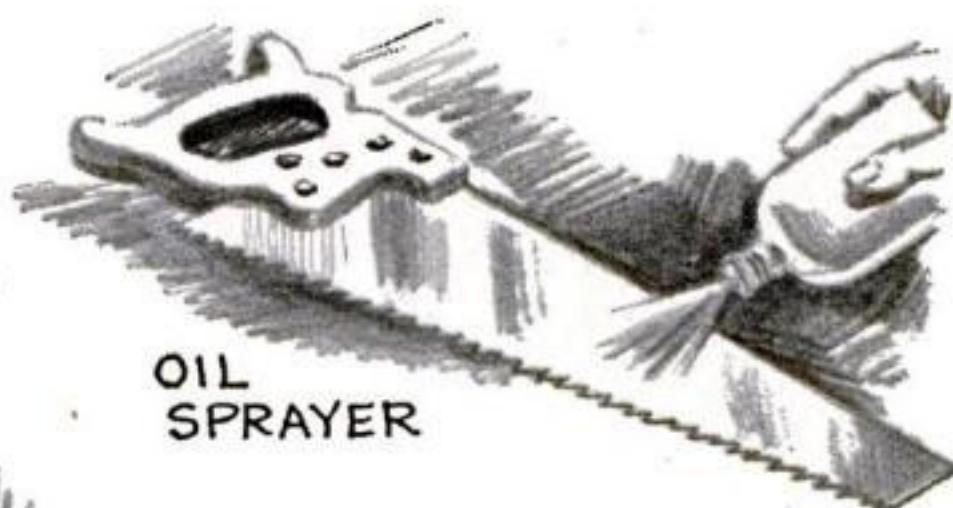
WINDSHIELD WASHER



PAINT
SPRAYER



QUICK STARTS
IN COLD WEATHER



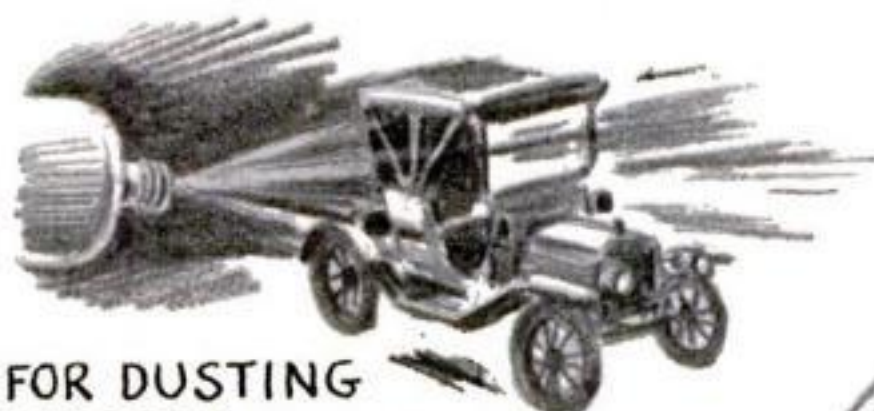
OIL
SPRAYER



GLUE DISPENSER



POLISH APPLICATOR



FOR DUSTING
MODELS (USE EMPTY BOTTLE)



LIQUID
SOAP
DISPENSER



BREAKPROOF
TRAVEL BOTTLES

It's Vapor-Lock

Season Again



By E. F. Lindsley

THE DRIVER of an expensive hard-top stopped halfway up a steep mountain road to admire the view. The turnout was 8,000 feet up, a sign on the lookout stand proclaimed. Ten minutes later the tourist confidently pushed the starter button. The engine coughed a few times, the starter whined—and that was all.

This was a real case of vapor lock. The driver had filled his tank before the climb with fuel for sea-level operation and moderate temperatures. A hard, fast drive across the desert had heated the engine and the fuel in the tank. The hard pull up the mountain had added to the engine's heat. Stopping this superheated engine in the reduced air pressure at the

high altitude had caused the hot fuel to boil, vaporizing into bubbles in the fuel line.

Although the car was in perfect mechanical condition, it would not start because of a fat bubble of vapor in the fuel pump and some smaller bubbles in the carburetor discharge tube.

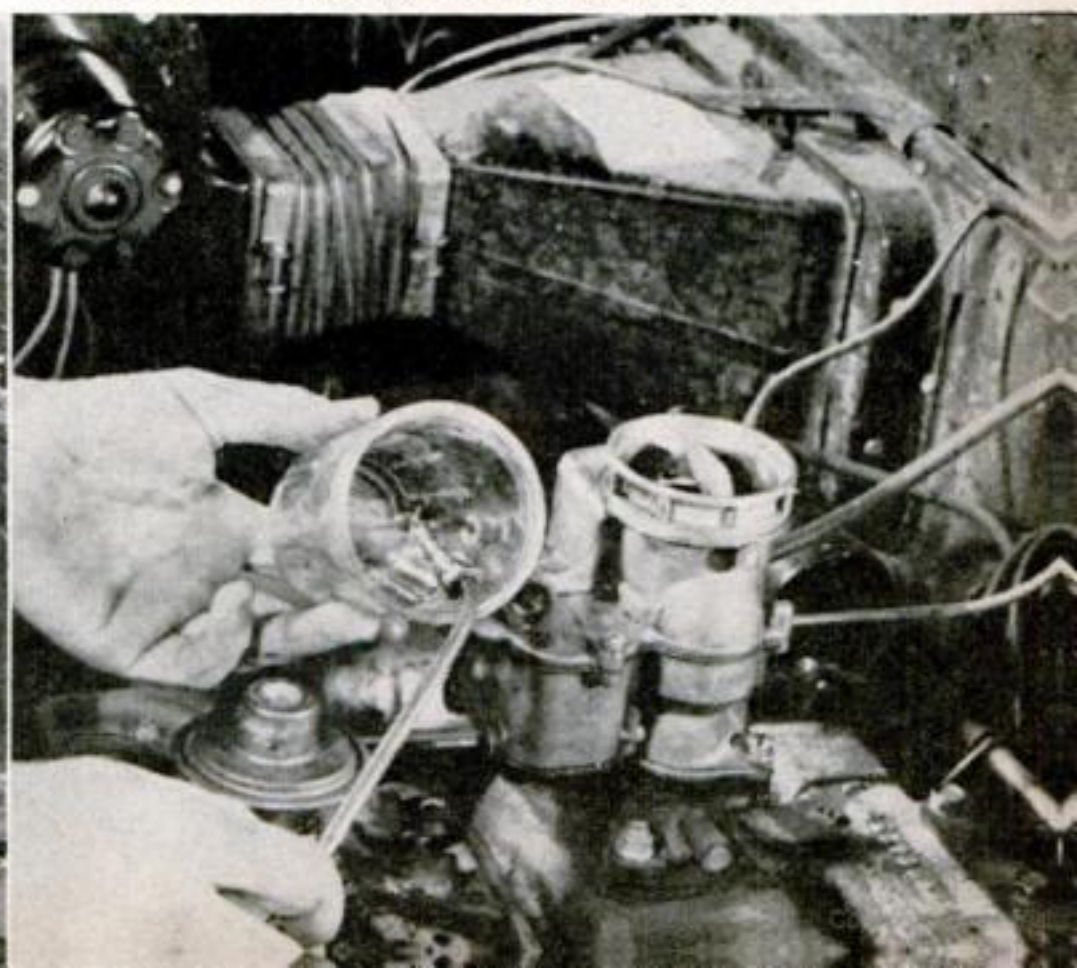
Cools off hot fuel system. The operator of the roadside lookout had seen this happen before. He lifted the hood to let the cool mountain air at the engine, poured cold water over the fuel pump, fuel lines and the outside of the carburetor, and removed the cap from the gas-tank filler tube. The car soon started. If it had not, he could have played his ace—a tire pump with a sponge rubber ball forced over the end of the hose. With this he could have put a little air

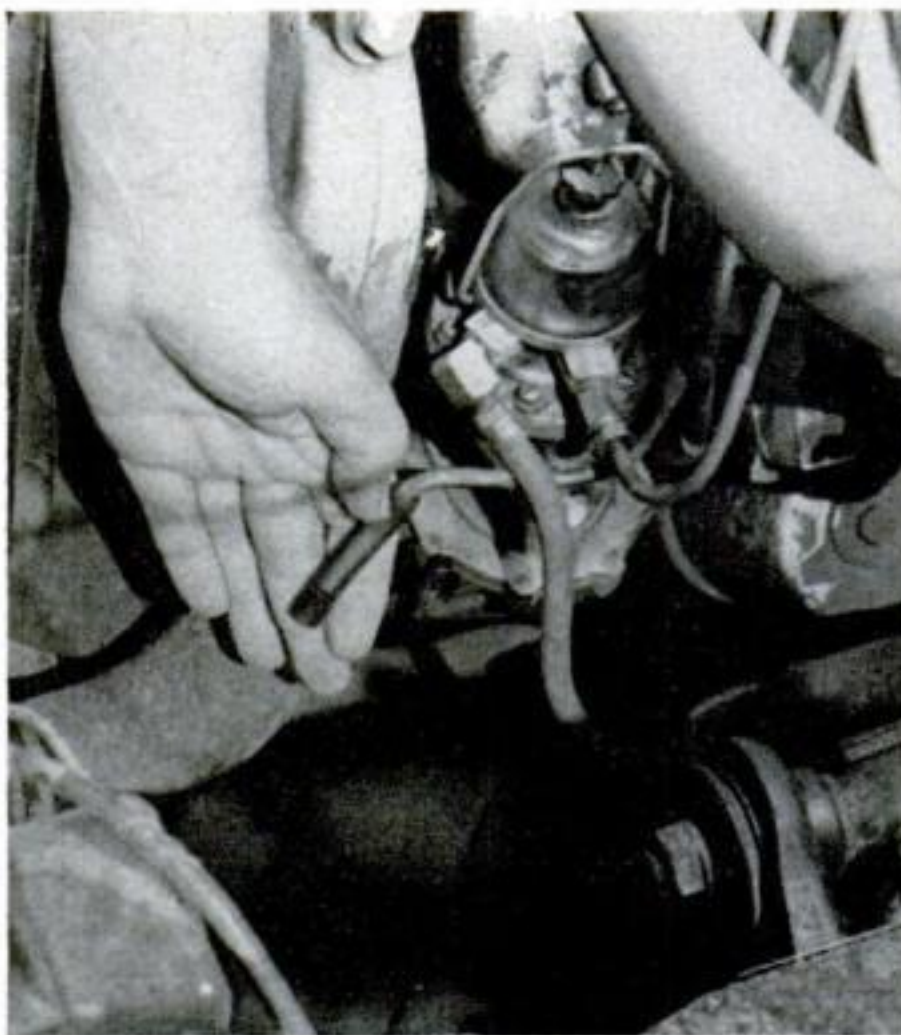


The lookout-stand operator lifted the hood and poured some cold water over the fuel pump.

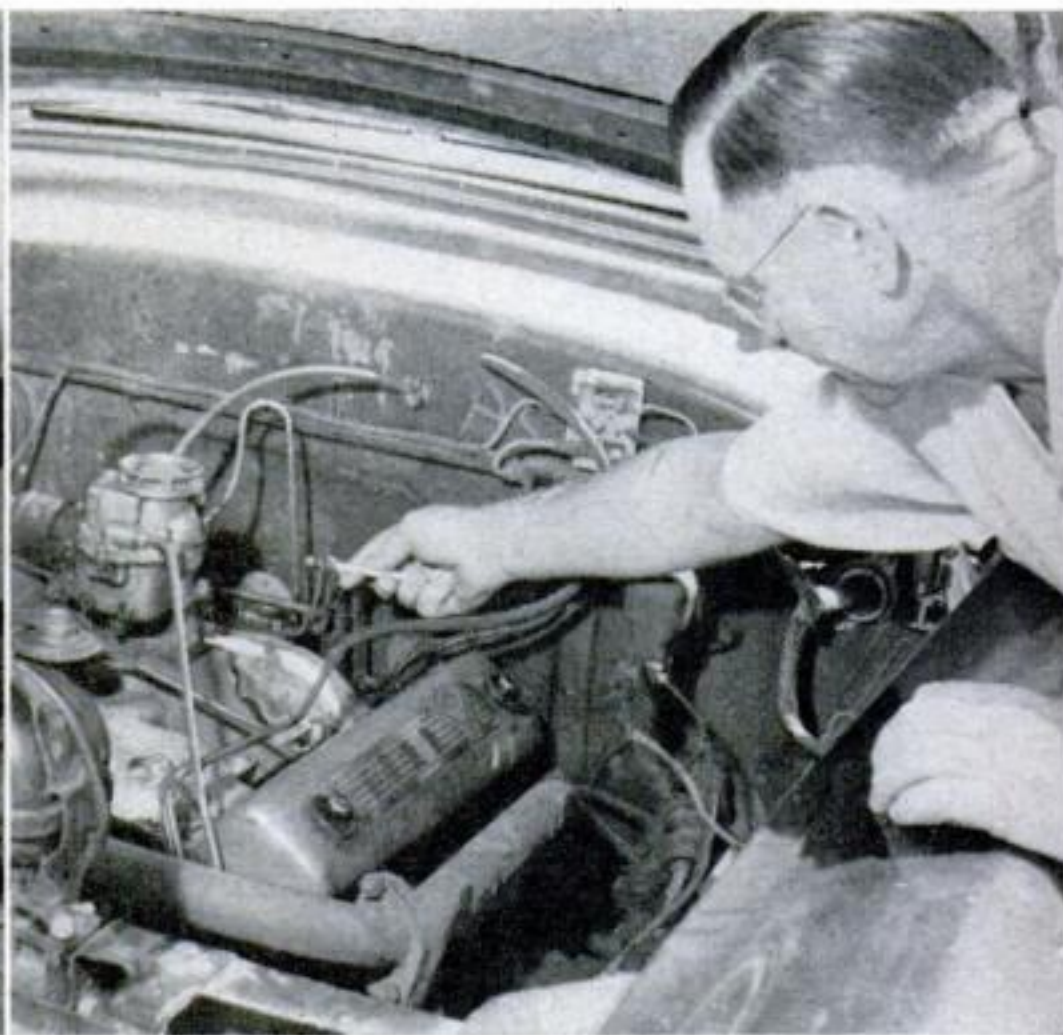
QUICK FIRST CHECK for any fuel trouble is to jiggle the throttle linkage while looking down the carb's throat (left below). If fuel squirts into the throat, carb is getting fuel. If carb is dry, disconnect fuel line at float chamber to

check pump. Hold line over a jar (right) and kick engine over with starter. A healthy pump will shoot a strong spurt of gasoline into the jar; a weak spurt or none at all will put the blame on the pump, line, or gas tank.





AIR LEAK in vacuum hose will cause a rough idle and lean fuel mixture. This hose has become heat-baked and cracked after 28,000 miles. The flexible coupling to the fuel pump should be checked for cracks and for "live" feel.



THROTTLE LINKAGE sometimes loosens and backs off so that flooring the pedal gives only half throttle. Adjust the linkage until the accelerator pedal controls a full throttle range and you will get the old pep back immediately.

pressure in the gas tank to force fuel through the fuel line and into the pump.

A pure case of vapor lock like this is rare in a car that is kept in good shape. Ten to one, if you have vapor lock under normal driving conditions, something is fouled up in the fuel system. A Saturday morning checkup in the shade of your garage may save a harassed Sunday afternoon on some hot highway.

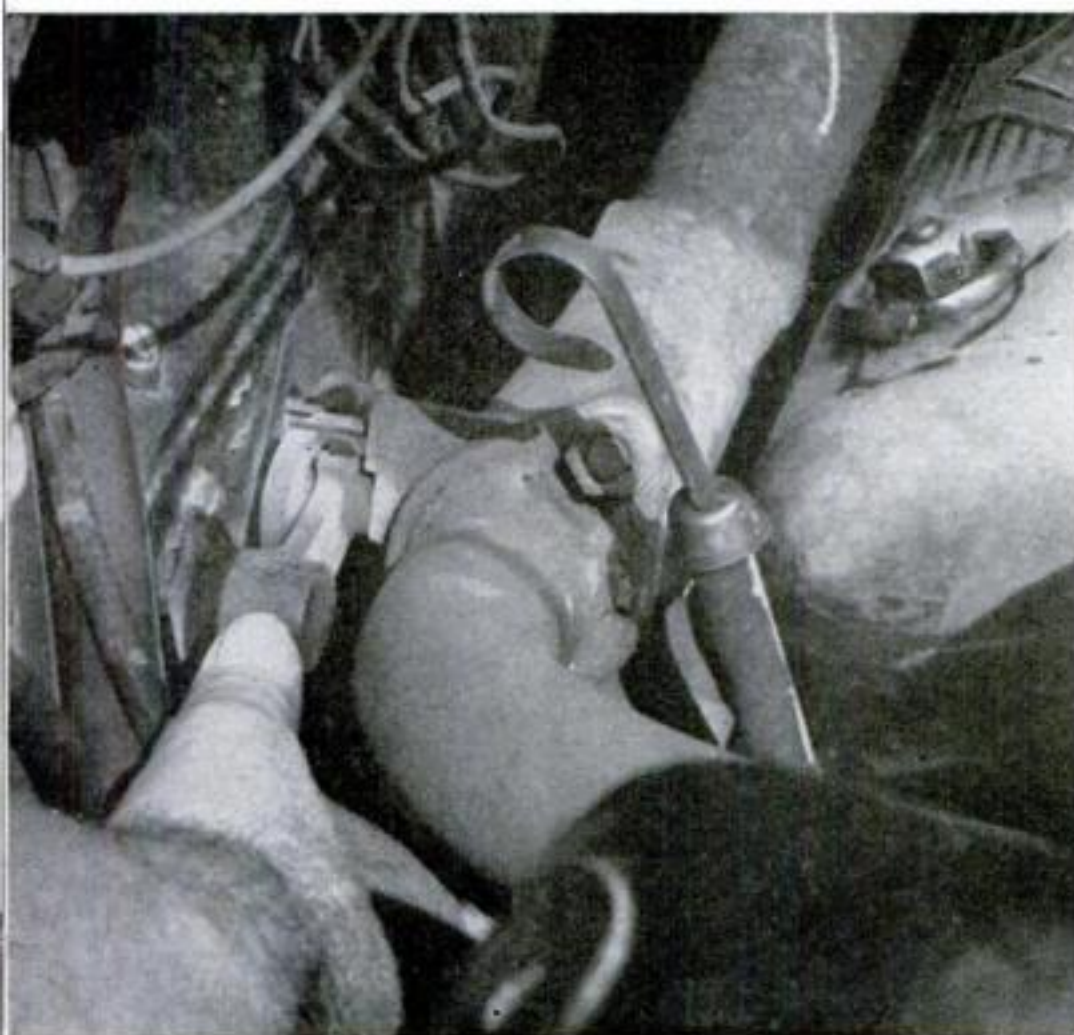
Start at the gas tank and work your way up to the carburetor. Chances are that a new car that has been kept well filled with gas won't have anything wrong at the tank, but any car, new or old, that has been standing half empty can distill a lot of moisture on its tank walls. This will condense in the bottom of the tank. Pull the drain plug and drain out the gas. Pour in a quart of alcohol and jump on the bumper to slosh it around. Then drain it out. Check the vent hole in the gas cap, too; if clogged it will prevent the pump from sucking gas.

Follow the fuel line under the chassis and check every inch for dents, worn spots where retaining clips might be rubbing, sharp bends or kinks and any signs

of wetness that would indicate leakage.

Check fittings and couplings and snug them up. Look over the short flexible line that joins the fuel line to the fuel pump. This flexible coupling absorbs engine movement and vibration; check it for cracks and make sure that it has a lively feel. Replace a line that feels stiff and hard. See that no part of the fuel line lies close to the exhaust manifold. Most cars are designed to keep the two apart, but sometimes bending or replacing a line brings it near a hot spot that causes fuel to boil.

The fuel pump is really the heart of the fuel system, beating continuously to move the gas from the tank to the carburetor. A pump is easy to remove. So for easier inspection and cleaning, take it off. Check the number to see that it is the correct pump for the year, make and model of your car. Most pumps look pretty much alike and someone may have replaced the original with a similar, not quite identical model that works, but not as well. Carefully remove the bowl around the filter element and wash both in gas. If the bowl gasket is ragged or



MANIFOLD HEAT CONTROL VALVE can cause vapor-lock symptoms. Stuck closed, it keeps carb too hot, causes fuel to boil; stuck open, it gives poor warmup, leads to carburetor icing. Wobble the counterweight to be sure that it's free.



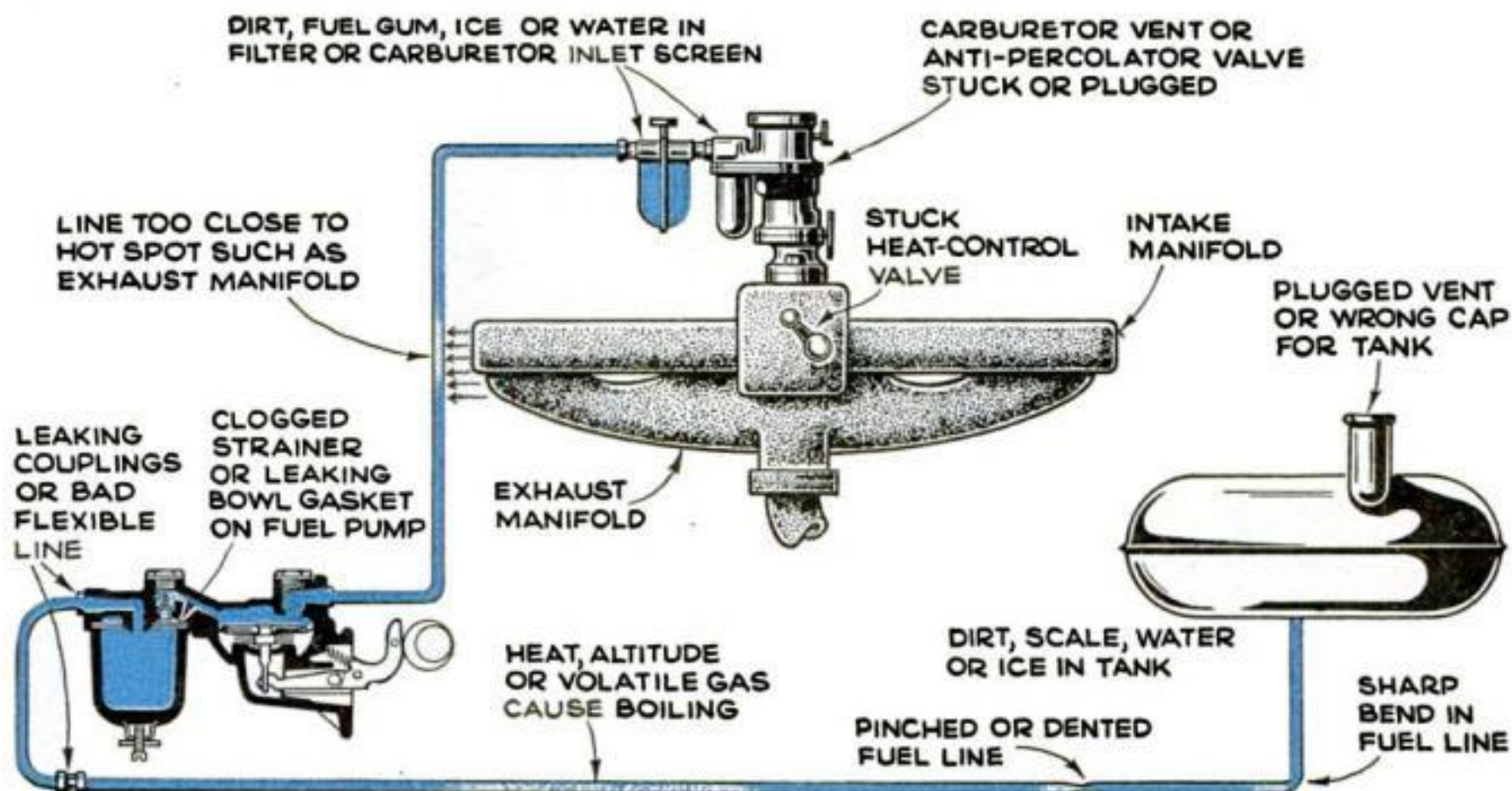
SELDOM-NOTICED TAILPIPE may become choked with dirt that you may have backed your car into, causing exhaust back pressure and hot engine operation. Look at it once in a while to see that it has not become bent or obstructed.

hard, replace it—you can get one at a local auto-supply store. A poor seal here will permit the pump to inhale air and mix it with the fuel going to the carburetor; even a tiny amount of air will affect performance. For the same reason, try to snug down the diaphragm-retaining

screws that encircle the pump flange.

Car builders say that the fuel pump diaphragm moves only about 1/64" in normal operation. This little flutter occurs intermittently as the fuel level in the carburetor drops and opens the float needle valve. See that there are no pieces

Check your car against this chart to find fuel-system trouble



of gasket stuck to the block or pump; this would shim the pump out, keeping the arm from getting a full stroke. When installing a new pump, use a new gasket the same thickness as the old one.

Check carburetor. Move along to the end of the fuel line to the carburetor. When a hot engine is stopped, the heat beneath the carburetor can cause the fuel in it to "percolate." Late-model carbs vent vapors through large passages, and eliminate percolating. Older cars were sometimes equipped with an anti-percolator valve to unload vapors; you'll recognize this as a useless-looking little spring-loaded valve on the float bowl

cover. A cam from the throttle linkage opens the valve when the engine idles or stops. As the throttle is opened, the valve closes and venting occurs through other passages.

Wash these parts with lacquer thinner and a small brush if they are covered with fuel gum. A complete disassembly and cleaning of all carburetor parts with lacquer thinner is always a good idea, but unless you're relaxed when taking apart alarm clocks, TV sets and Yale locks, take this job to a carburetor expert.

Finally, for trouble-free driving, dunk the carburetor's air cleaner in gas, shake or blow it dry and re-oil it. END

Window Plant Box Lined with Rustproof Lead Flashing



LEAD LINER IS SLIT with a handsaw 1" from the bottom for an aeration vent. Bend inward over the cut to keep the soil from spilling out.

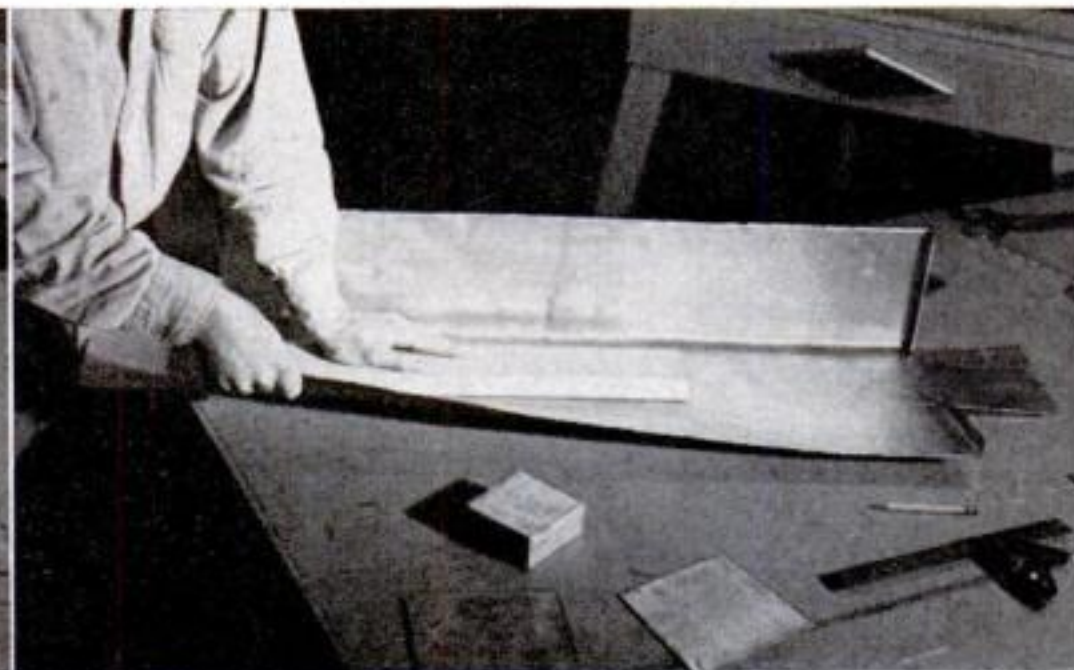
LEAD IS EASILY CUT to make the notches for the corners. Leave a 1" overlap on the front and the back for the soldering surfaces.

SHEET lead is an easy-to-work material for lining planting boxes. It won't rust. You can get it at plumbing-supply houses as 3-lb. stock, which plumbers use for vent-pipe flashing.

Lay out the inside dimensions of your box on the lead sheet. Then cut out the corners with tin snips, leaving an overlap for soldering the joints. Solder after the finished liner has been inserted in the planting box.

After bending to shape, cut a vent slit to allow air to get to the soil. Drill a pilot hole first and lengthen with a penknife to admit the end of the saw. A matching vent will, of course, have to be sawed in the outer wood box.

BENDING IS SIMPLER if a wood block is used as a guide. The 3/64"-thick sheet lead can be worked into shapes other than rectangles.





Transistor Portable Plays 45's Anywhere

By Howard G. McEntee

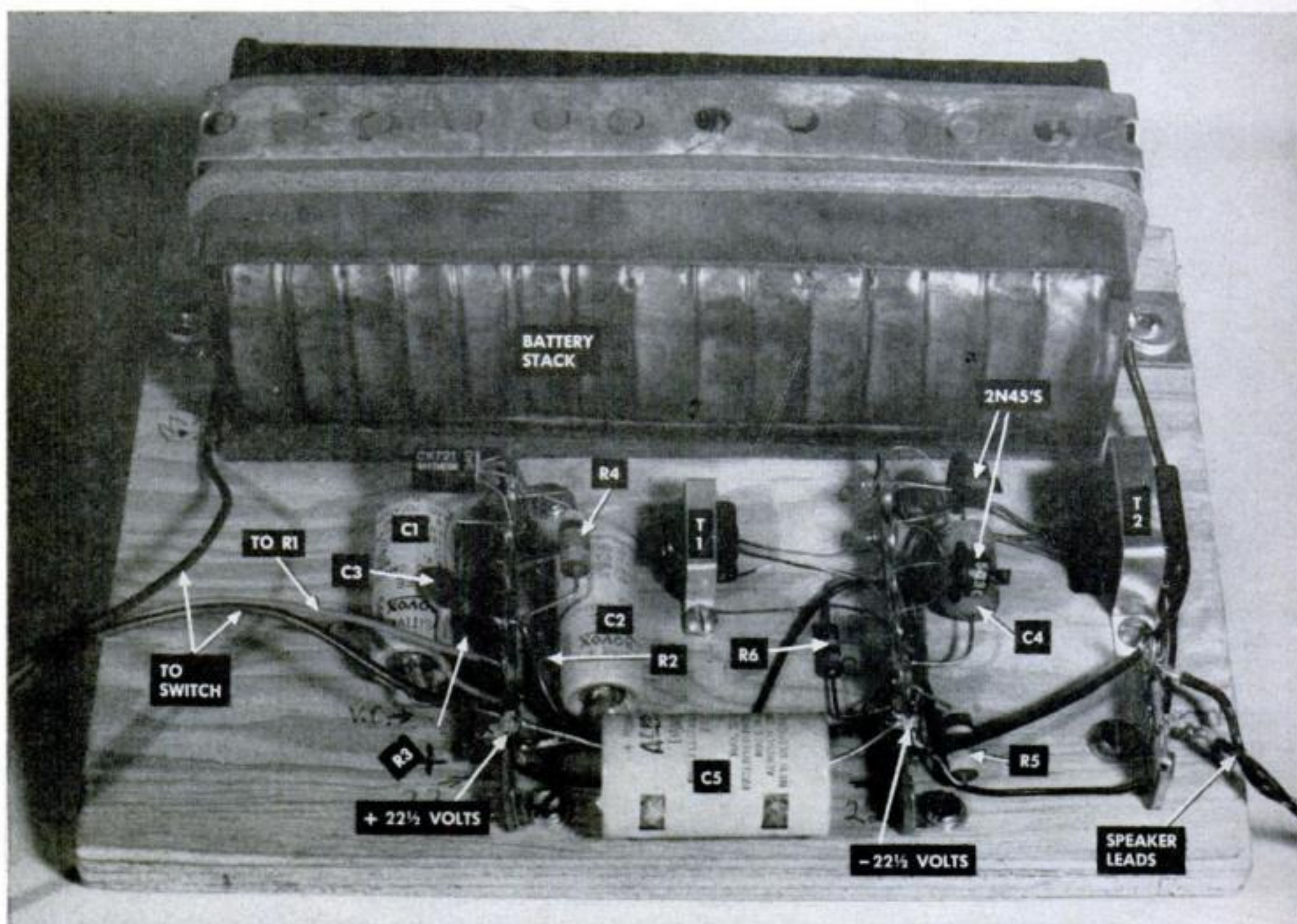
YOUR 45-r.p.m. records can go along with you to make music wherever you are, even beyond power lines and the reach of radio stations. Here is a homemade record player designed to work anywhere, anytime. It needs only one battery, for it has a transistor amplifier and a wind-up motor.

The class-B transistor amplifier delivers a quarter of a watt output—enough

for good room volume—yet it takes little current, drawing a maximum only on the loudest passages.

Selecting the motor. The small single-spring motor shown, altered to turn at a reliable 45 r.p.m., plays both sides of a standard 45 disk before it needs another boost. Motors like this can be bought for about \$6. A dual-spring motor would run longer, but would make the unit heavier, less convenient to carry around.

You may be able to take your motor



HALF OF A "B" BATTERY is held on the amplifier base by a length of perforated pipe strap. As the flat battery cells are held in contact by

pressure alone, the strap is run from end to end rather than crosswise. Thin sponge rubber cushions the strap and battery stack all around.

out of a discarded wind-up phonograph, and if it's portable use the case, too.

Mounting the works. If you do use an old portable, you can probably leave the motor where it is and fit the speaker, battery and amplifier around it. Should

you buy or build a case, the turntable diameter will determine its dimensions. The ready-made luggage case shown here is 6½" deep, 9½" wide and 13½" long.

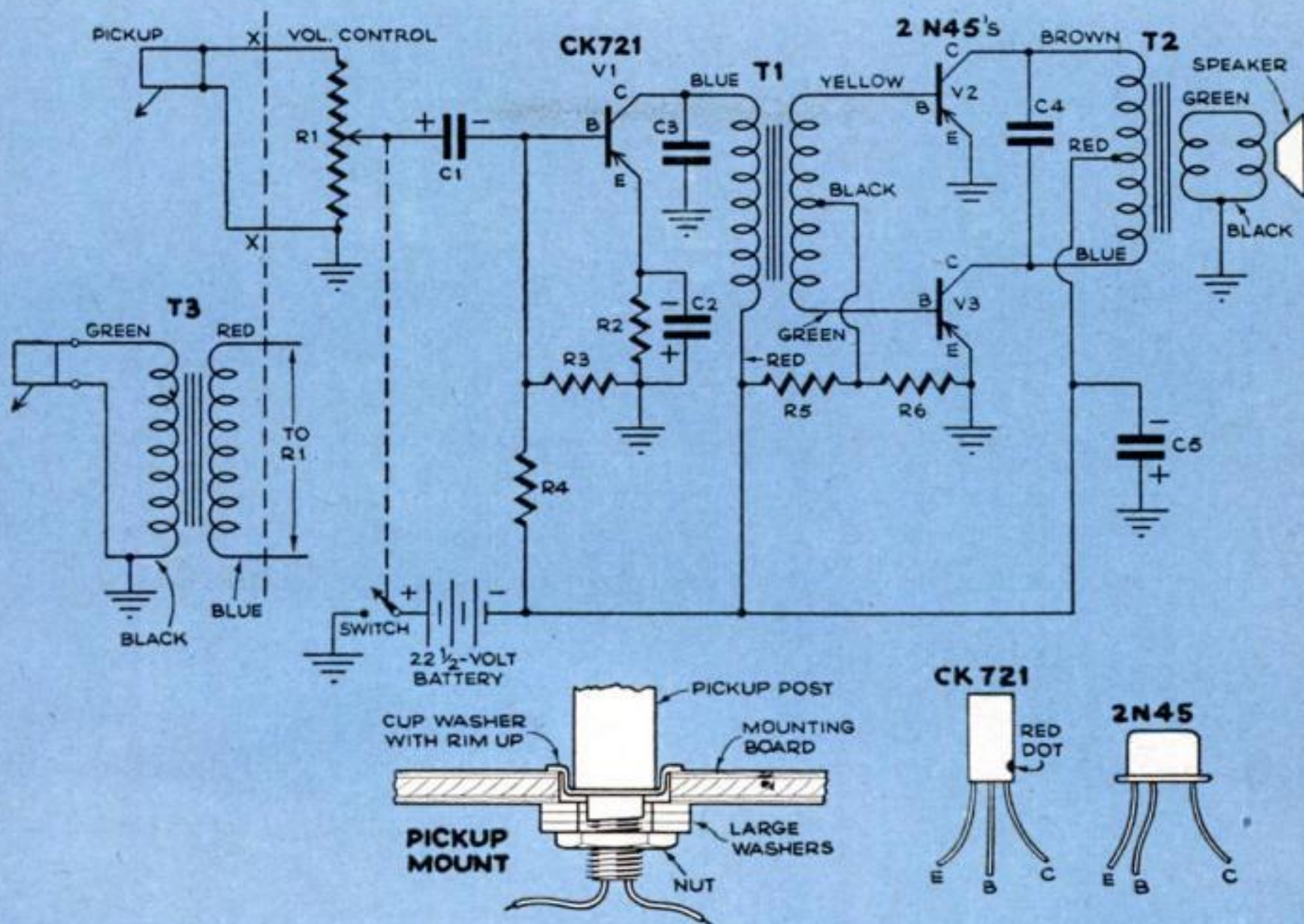
Cut a mounting board from ¼" plywood to fit inside the case. Then use the

PARTS LIST

V1: CK721 transistor	R2: 4,700 ohm, ½ watt carbon
V2, V3: 2N45 transistor	R3: 10,000 ohm, ½ watt carbon
T1: Class B input transformer (Fed. Purch. 402W5)	R4: 47,000 ohm, ½ watt carbon
T2: Class B output transformer (Fed. Purch. 402W6)	R5: 12,000 ohm, ½ watt carbon, 5% tolerance
Pickup: (Fed. Purch. 402X7)	R6: 68 ohm, ½ watt carbon, 5% tolerance
Speaker: 4" X 6" oval speaker (Quam 46A15 or equiv.)	T3: any small 3-1 A.F. transformer (optional)
Battery: 22½ volt, see text	78 r.p.m. windup phono motor (Gen. Industries, "Master Junior")
C1, C2: 25 mf., 25 volt electrolytic	Misc.: Case, plywood, 2 6-lug strips, speaker grille, knob, fuse clips, etc.
C3: .005 mf. disk ceramic	
C4: .05 mf. paper	
C5: 100 mf., 25 volt electrolytic	
R1, SW: 10,000 ohm variable, with SPST switch (IRC Q13-116)	



MEASURE HIGHEST PART on the mounting board (probably the pickup post) and the depth of the case lid. Cement small wooden posts into the case at a height that allows parts about ¼" of clearance with the lid shut. Fasten the board in with wood screws driven into the posts.



AMPLIFIER is simple to assemble, but should be built with parts specified because transformers were selected to give best results with

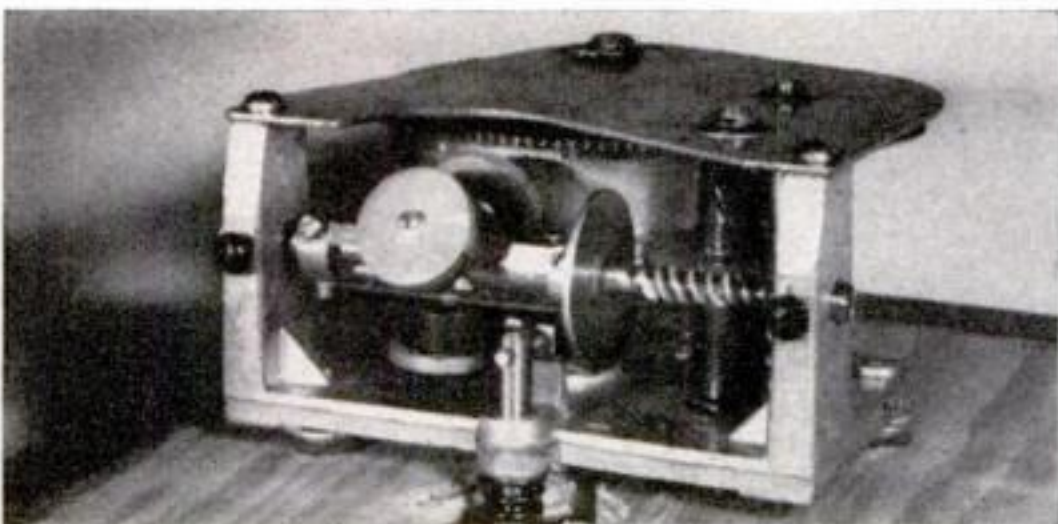
these transistors. Dashed line at left of diagram indicates connections for optional transformer, which may be desired for greater output.

turntable and pickup arm to plan the layout. Locate the motor so that the crank will emerge at the front or right side. Spot the pickup pivot, using the maker's instructions, so that it tracks correctly.

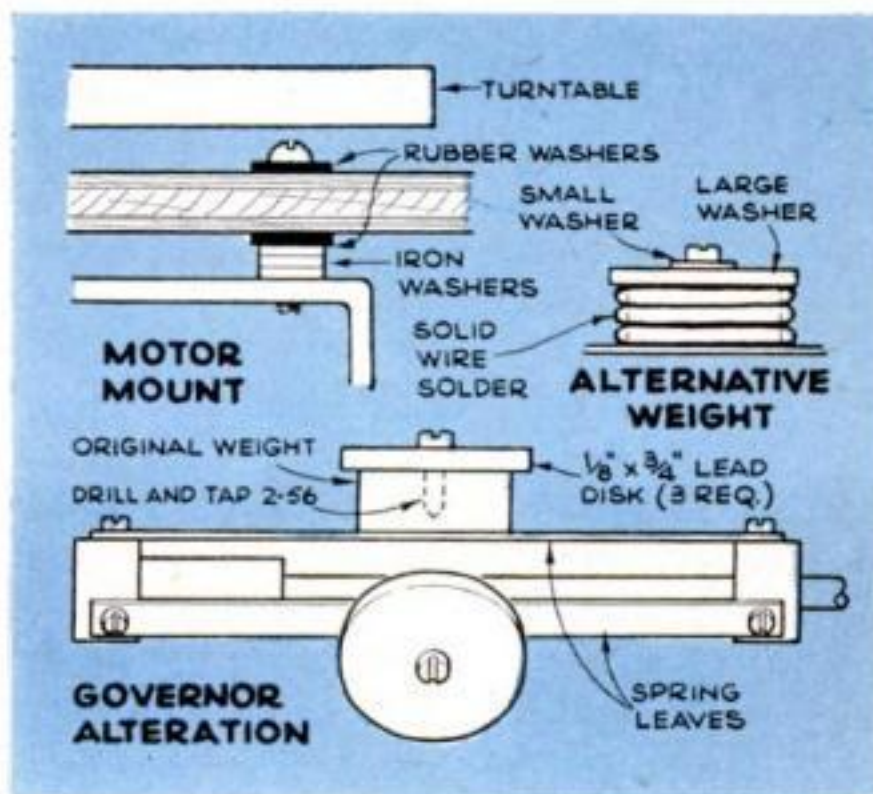
Use rubber washers on the motor

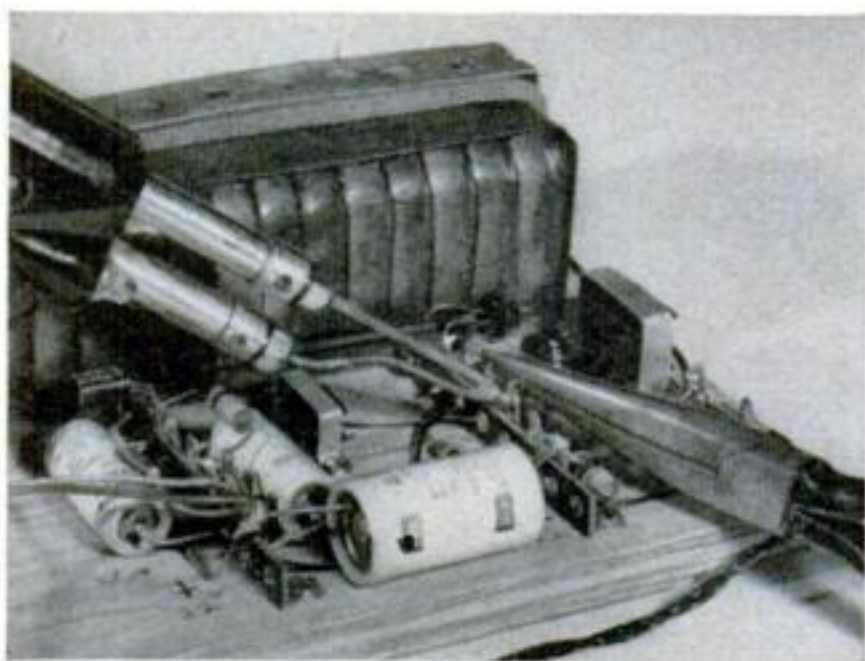
mounting bolts on both sides of the board. Space the motor an extra 1/4" below the mounting board with washers.

How to maintain 45 r.p.m. A spring motor may not hold to slow speed over the full range of spring tension. So add a



GOVERNOR IS GIMMICKED to improve regulation at low speed by adding lead disks to the weights. If lead is not available, use iron washers or wrapping of wire solder as in the drawing (right). Make certain that weights will not strike frame when springs bow out in motion.





NO SOCKETS ARE NEEDED for the transistors. Cut leads 1" long and solder them to the lug strips. To protect the elements from heat, hold each lead with long-nose pliers just back of the lug. Hold the pliers shut with a rubber band.



DEEP WELL at one end of this case holds 45-r.p.m. records vertically. Battery and amplifier are on a 6"-by-8" panel screwed to the case bottom.

bit of extra weight to each of the governor weights. Take out the screws at the ends of the flat spring leaves to remove the weights. Drill and tap these at their centers for small machine screws.

Small lead disks are excellent for the auxiliary weights. Ordinary washers will do or, if space is lacking, use a thin washer with a few turns of solid wire solder, as in the drawing. If possible, weigh each weight to get them alike.

To adjust the motor to 45 r.p.m., put a slip of paper under a record and count revolutions against a watch, or use one of the stroboscope disks sold for check-

ing turnable speeds. When speed is determined, lock the adjustment.

What size battery? If your case is small or you want to keep weight down, use a 22½-volt C battery such as the Eveready 763 or equivalent. This will give upwards of 50 hours' use.

A more economical deal is the 45-volt Eveready 487, which has two stacks of 22½ volts each. Cut them apart and use one at a time; each is good for more than 125 hours. Or you could solder 15 flashlight cells together.

Amplifier. It is important to stick to the parts specified. The 2N45 transistors will carry the high currents involved, and the transformers named are specially made to match them. Others may give inferior results.

Mount the transformers with straps cut from 1/32" aluminum. All the other parts, including the three transistors, are soldered to two lug strips.

The transistors are the PNP types, with which the positive side of the battery goes to ground. Be careful to connect the electrolytic condensers accordingly (plus to ground, the reverse of tube-circuit practice).

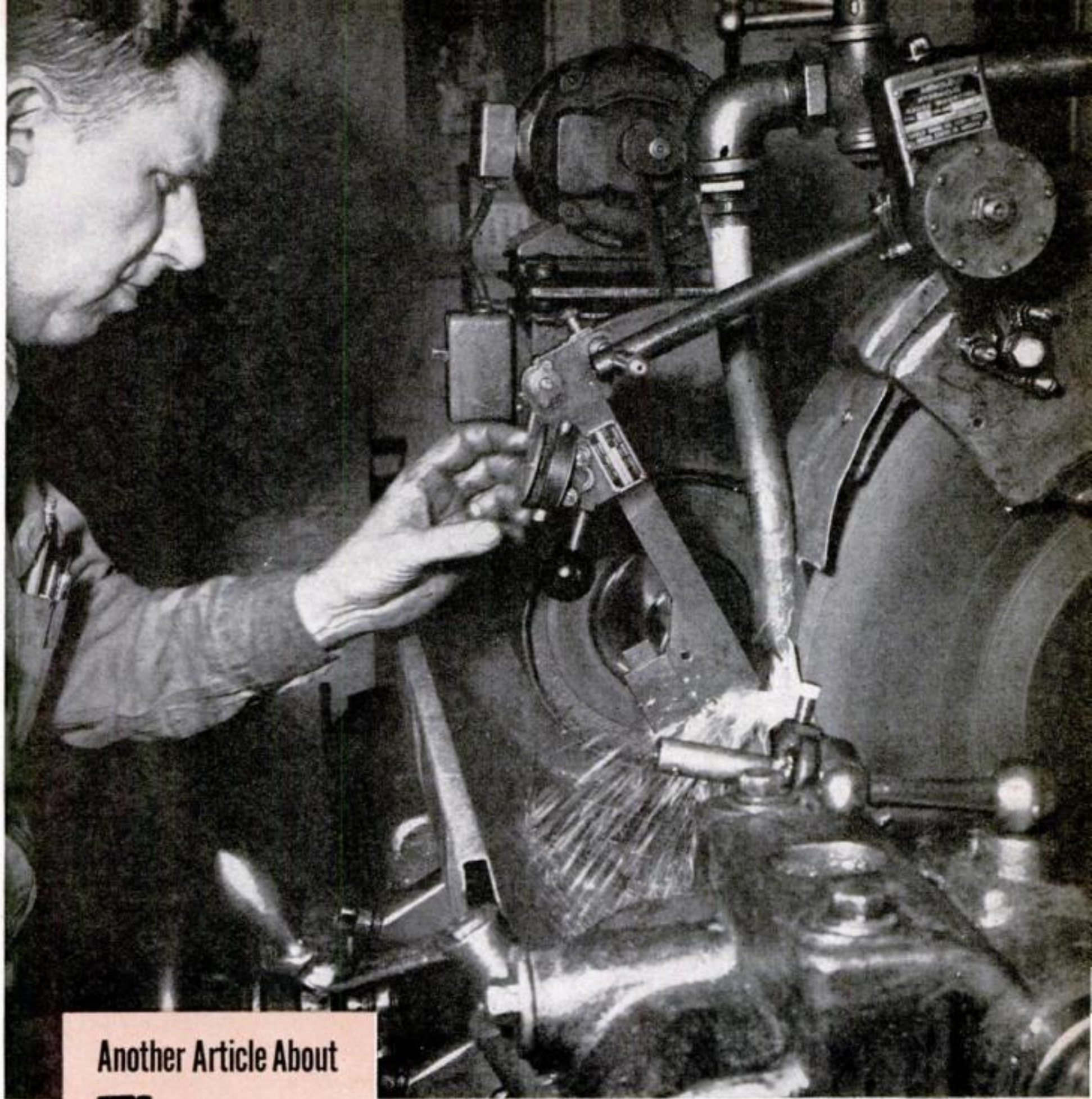
The high-impedance pickup is hooked directly to the relatively low-impedance volume control and input circuit. This eliminates one transformer at the cost of gain. If you need more gain or use a low-output pickup, connect a 3:1-ratio audio coupling transformer (T3) ahead of the volume control at the points marked x-x in the wiring diagram.

Final touches. Mark out the opening for the speaker in one wall of the case. Slit the fabric 1" inside this with a razor blade, and fold it back so that you can cut through the wall with a keyhole saw. Then tape or cement the fabric covering back around the hole.

For a record compartment, saw a notch out of the mounting board and build a box in the case below it. The walls can be of hardwood, cemented together.

Mount two cartridge-fuse clips inside the lid to hold the winding crank, and a smaller clip on the mounting board for the pickup head.

END



Another Article About
**The
Other
Fellow's
Shop**

Contract Jobs Are His Business

***Otto Bruns applies hobby skills to big-plant headaches
—and turns them into substantial small-shop profits.***

By Phil McCafferty

TWELVE years ago Otto Bruns backed his automobile out of the garage to make room for a modest home workshop. Today, that same little shop is a bustling small-parts factory that turns out everything from pearl-button cutters

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to hydraulic valves for heavy earth-moving machinery.

Bruns was a machine-shop foreman in a Marion, Iowa, war plant when he first set up his hobby shop in the garage. After his 12-hour factory shifts he still found relaxation in designing and machining precise firearms parts. He also found a customer for every rifle he could produce. But this hobby business was soon crowded out by less romantic work.

The war plant that employed him was making an experimental relief valve for a hydraulic control system. The heat-treated steel was so tough that machinists were lucky to complete three valves per shift. When the valve proved its worth nobody knew how to put it in high-speed production.

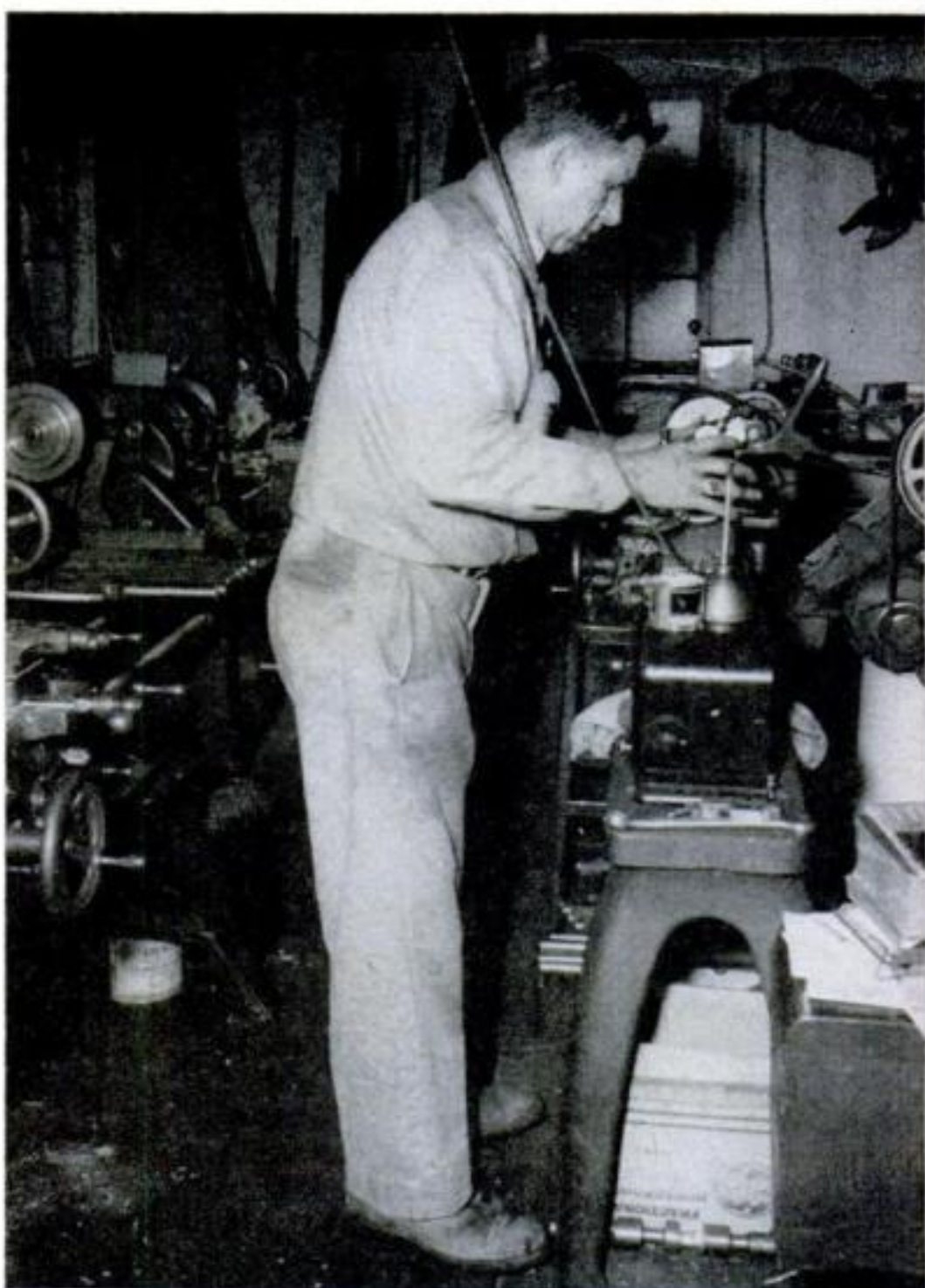
Bruns asked if he could experiment with a dozen of the valves in his own shop. Working with his only power tool—a 10-inch bench lathe—he finally hit on a solution to the production headache. He found that a tool made of high-speed cobalt-alloy steel not only bit into the tough stuff, but brought the valve face to a finish and tolerance better than the specifications called for, without resorting to grinding. When he took the machined parts back to the plant he was offered a sub-contract to turn out the

.....
This is one of a series of articles about noteworthy home workshops. See POPULAR SCIENCE MONTHLY next month for a story on another fellow's shop.
.....

entire batch of valves in his own shop.

On the strength of that contract, Bruns parlayed a local bank into financing a new 16-inch engine lathe. With that and an ancient cutoff saw he picked up for 10 dollars, he buckled down to his first production run. Soon he was putting out 50 finished parts a day.

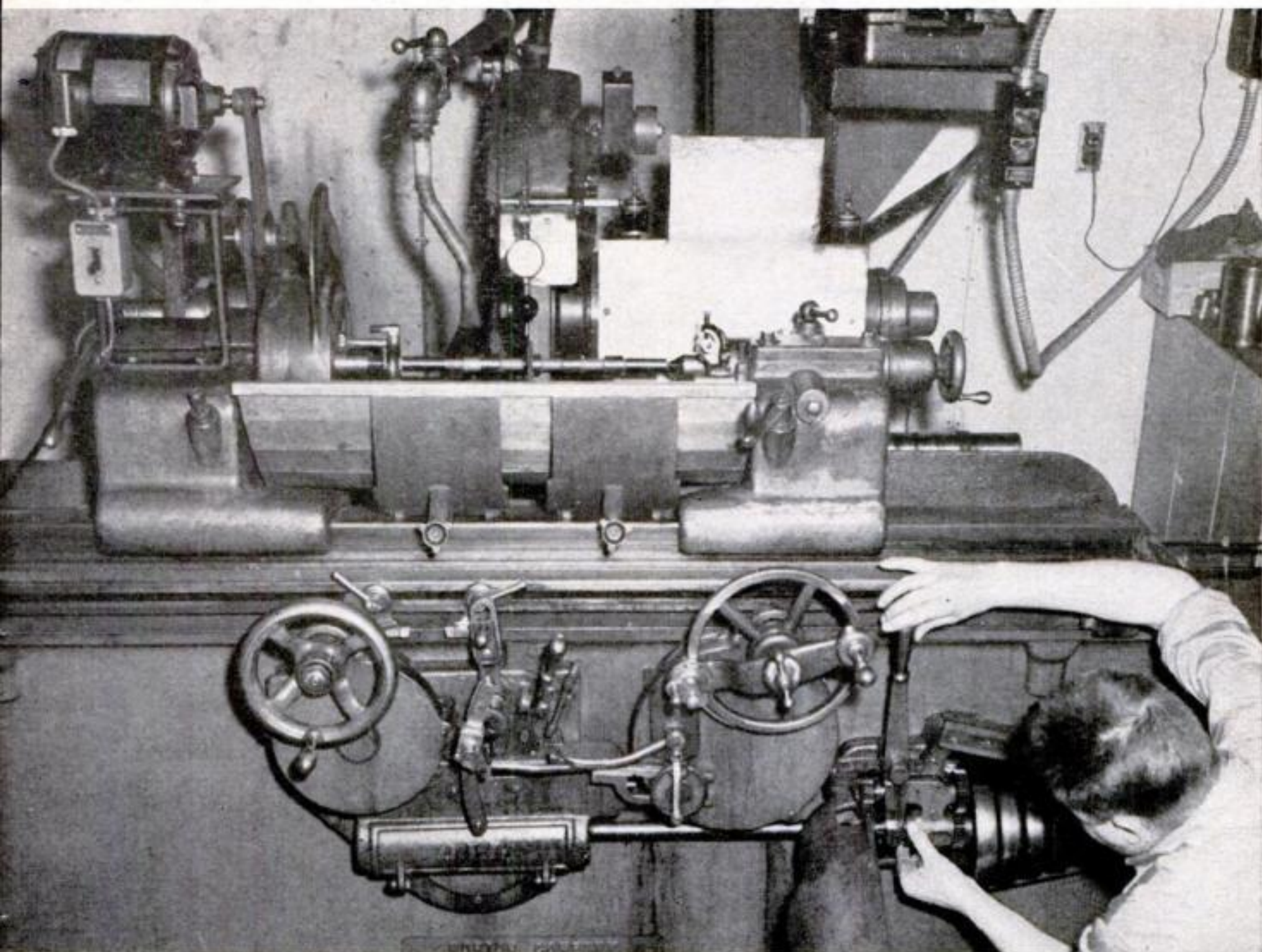
As Bruns' work became known in the area, new jobs came in. He found that little shops play an important part in today's industrial picture. Because large-plant overhead is so high, manufacturers often find it economical to farm out



LATHES ARE GROUPED close together to save steps. Often Bruns does turning operations on one lathe while another lathe, running on automatic feed, is making long initial cuts.

LARGEST "FARM-OUT" JOB that Bruns can handle on his lathes is this hitch pin for a self-propelled scraper. Knowing his shop's limitations helps Bruns to stay in business.



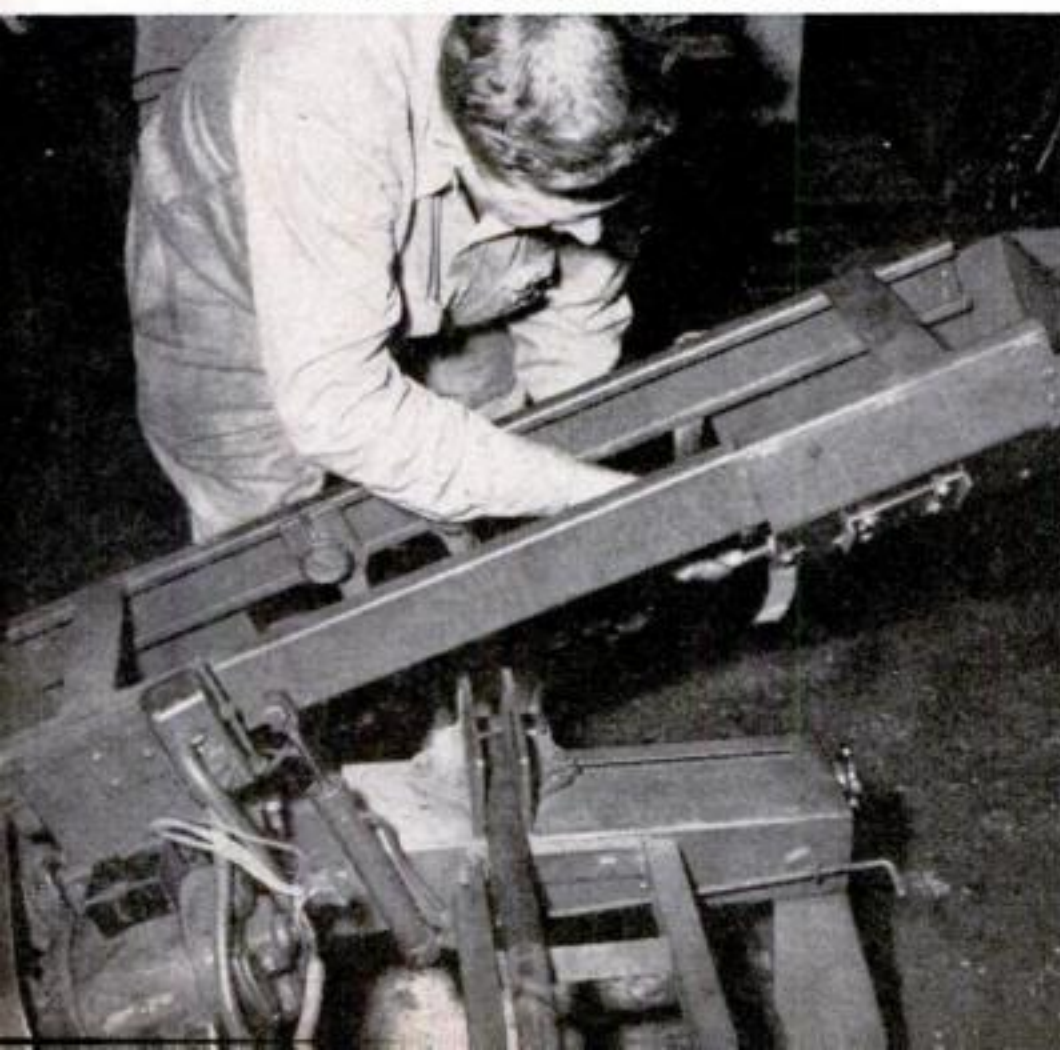


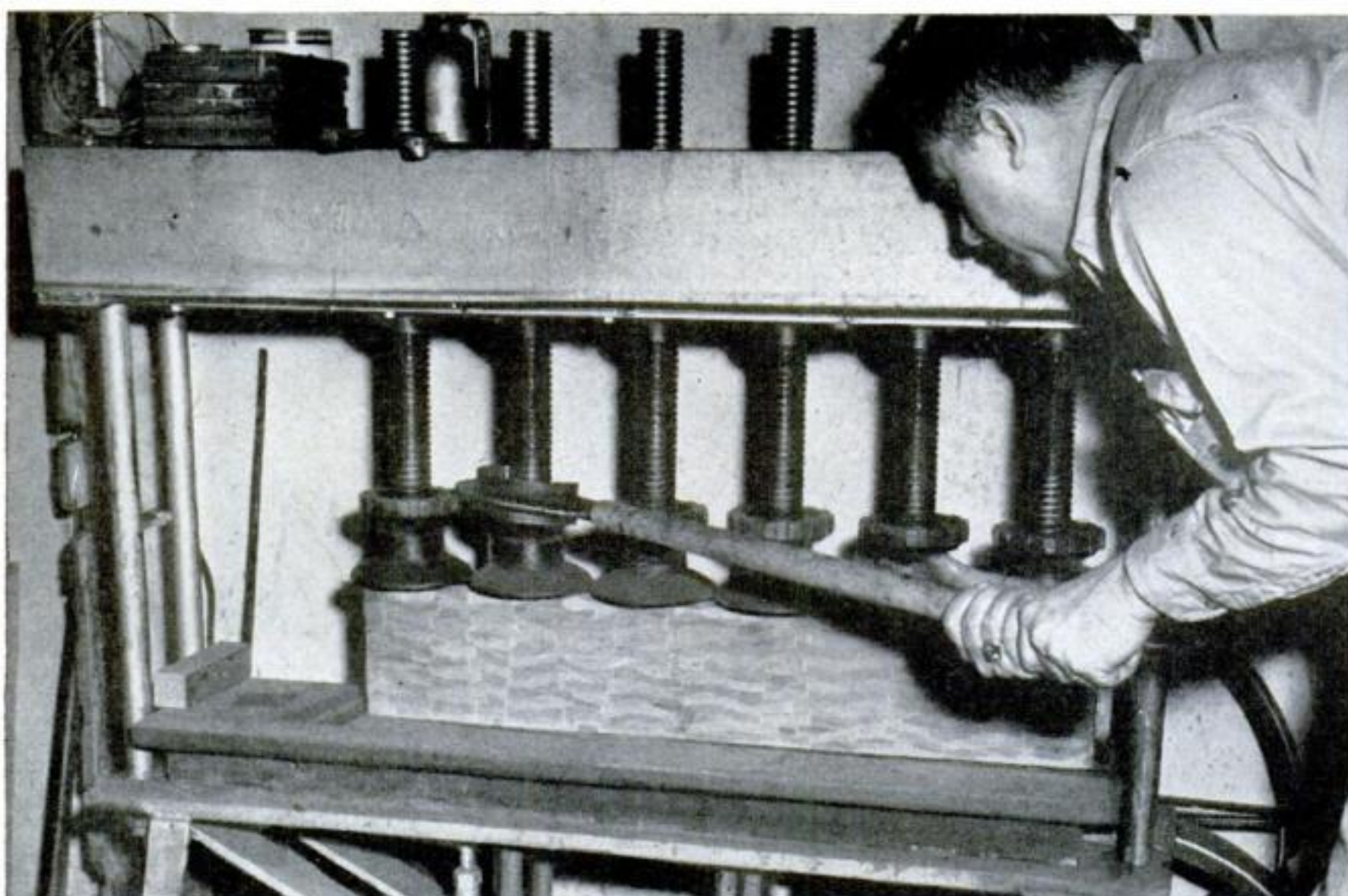
PRIDE OF BRUNS' SHOP is his recently acquired external grinder. For years it finished off crankshafts for an engine rebuilder. Bruns picked it up for practically salvage price and restored it.

The sub-contractor steers clear of automatic, mass-production machines that would take him out of his specialty business—which is handling short runs of complicated parts.

REGULAR MAINTENANCE prevents costly delays. Before Bruns starts each day's production, he checks and lubricates all machinery. Here, he gives his metal-cutting saw the once-over.

AS HANDY WITH A MICROMETER as she is with a measuring spoon, Mrs. Bruns can handle any machine in the plant. She also shops for tool stock and supplies, and keeps the books.





SPECIAL GLUE PRESS (above), was designed by Bruns to laminate wood for warp-proof rifle stocks. He cuts four stock blanks from a single built-up block. Another Bruns specialty is a cast-aluminum rifle stand for bench-rest shooters (left). He also made the handsome target rifle that is displayed on the stand.

specialized and time-consuming jobs. Also, if the run is small, it doesn't pay a big shop to hire temporary help.

From the start, Bruns was convinced that the success of his setup depended upon its staying small. As more and more orders came in, he resisted the urge to buy expensive automatic equipment for which he would normally have very little use.

His roster of power tools, even today, is modest in relation to the volume of work that he turns out. He has three engine lathes, a vertical and a horizontal milling machine, metal-cutting bandsaw, drill press, circular saw, bandsaw, welder, two presses, paint-spray equipment and grinders.

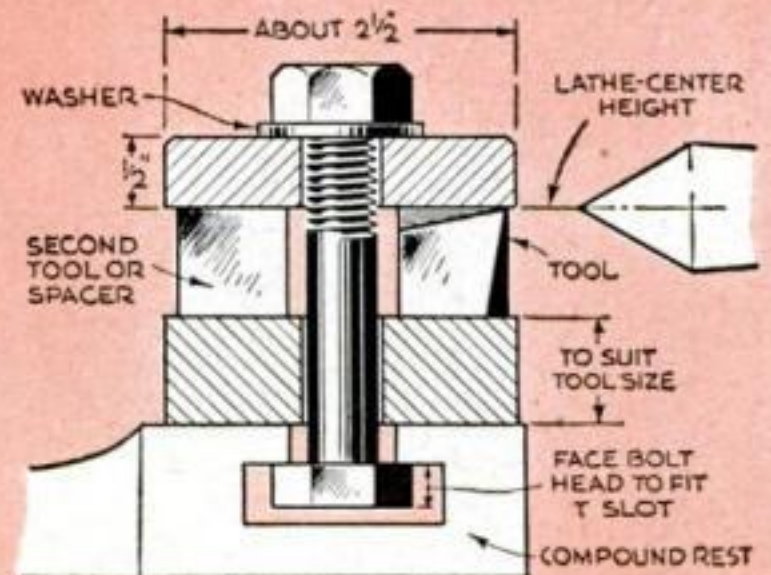
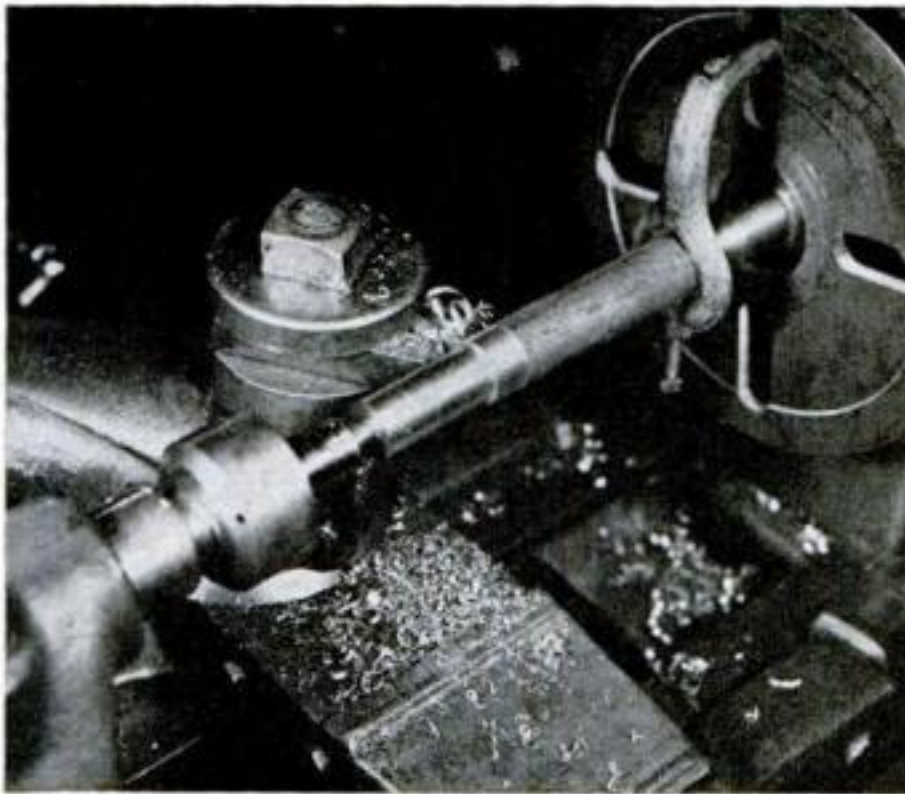
Also in keeping with the small-plant theory, Bruns' business is pretty much a one-man operation. Or, more correctly, it's a mister-and-missus business. For Bruns' wife is a top-notch machinist, too. When she isn't running the house and

looking after the two Bruns children, she's almost sure to be found either working in the shop or keeping up with the bookkeeping chore.

Much of Bruns' success can be set down to smart estimating and bidding. He knows exactly how much money he must make each work-hour. But figuring how long a job will take is something else. Bruns carefully examines blueprints and specs. Then he asks himself, what special tools? What material? Who supplies it? What are the tolerances and finishing requirements? How many cuts and operations?

More than mathematics, past experience enables Bruns to come up with the right answers. Take the time he won, hands-down, on the low bid he made to machine several hundred large bronze castings. The price he got for the job didn't even cover expenses. But he knew the salvage value of the chips—and that was his profit on the job. **END**

New Shop Ideas



Holder Centers Lathe Tools. This tool holder positions two tools, always keeps the cutting edges at lathe-center height, and can be set with your eyes shut. It is made of a $\frac{1}{2}$ " bolt and two pieces of $2\frac{1}{2}$ " bar or shafting.

Face a disk $\frac{1}{2}$ " thick and drill it for the bolt. Face another to a thickness that will

raise whatever size tools you use to center height. Face the bolt head to fit the compound-rest slot.

Mount a tool in each side of the holder, or use a spacer to secure even clamping with only one tool. Shim up smaller tools to bring them to correct working height.

—Phil McCafferty, Stanwood, Iowa.

Cutting Blind Slots. To cut narrow, closed slots in sheet metal, clamp the piece to a round or a half-round piece of wood. Then saw down to the ends of the slot layout. For a wide opening, drill a hole at each end and saw to it.—Federico Strasser, Santiago, Chile.

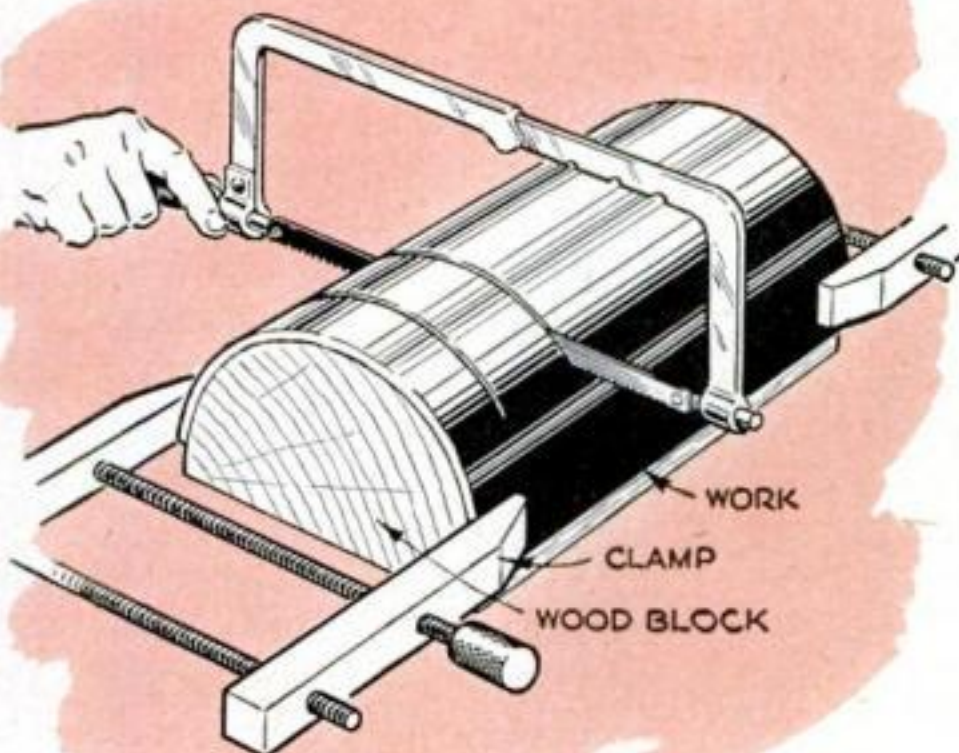
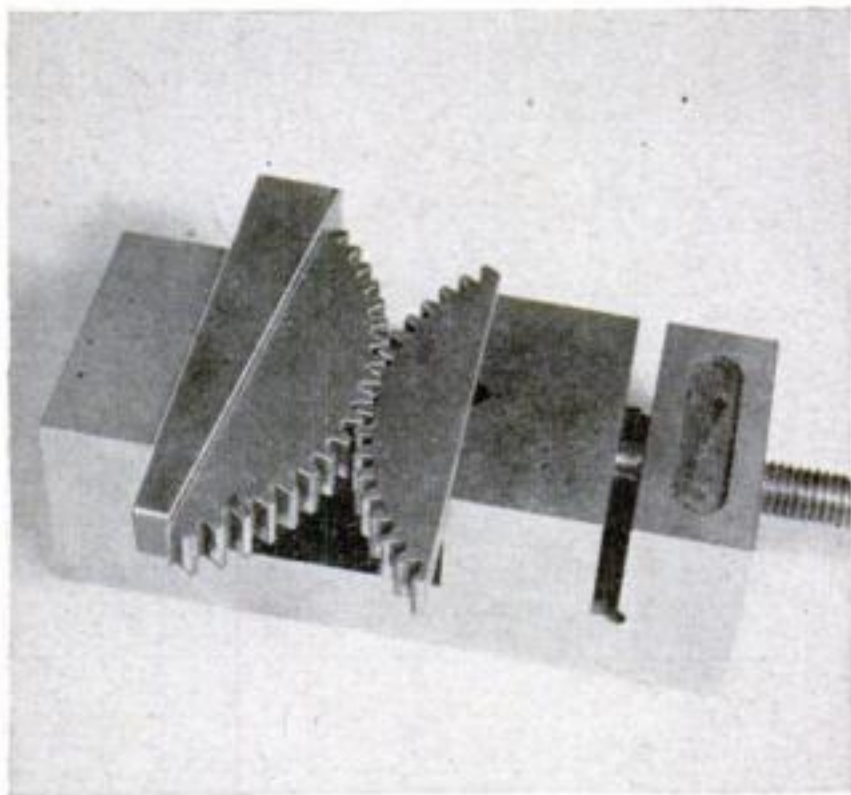


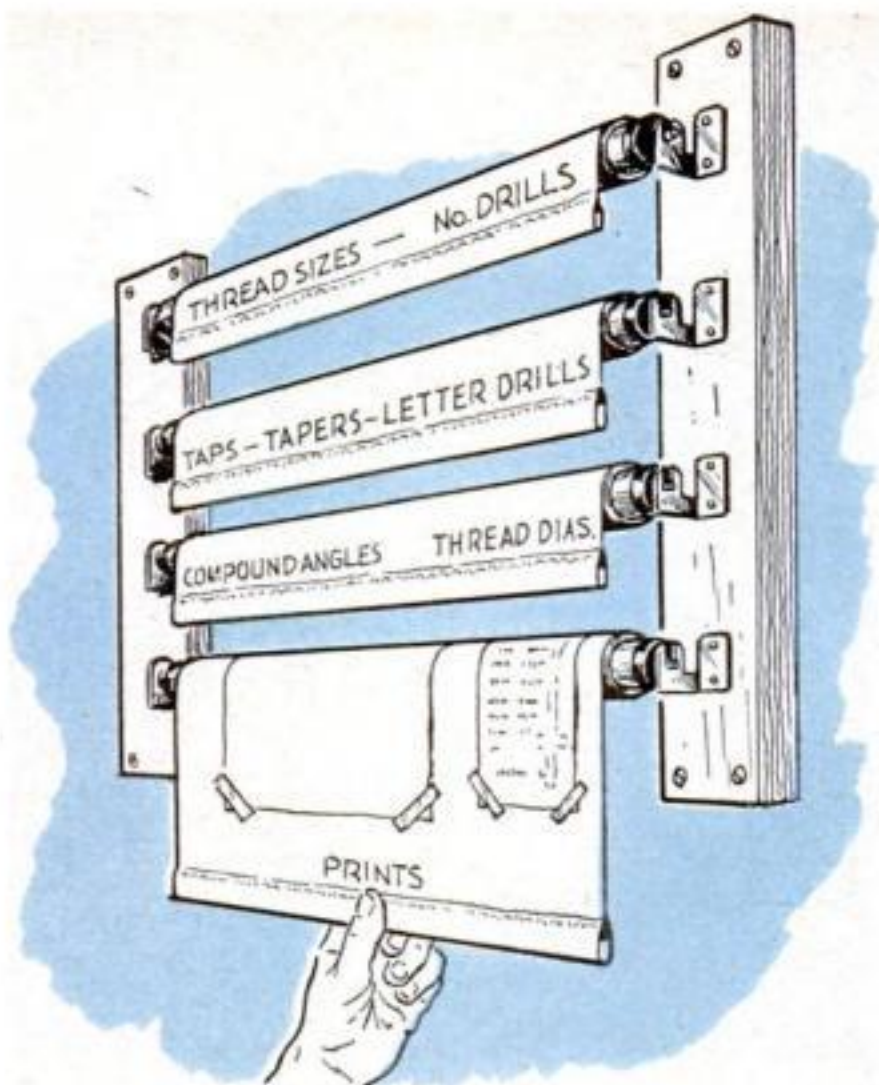
Plate Keeps Gear Data. It's easy to forget what change gears are on a lathe—or, on a quick-change lathe, whether metric or regular gears are in place. An aluminum plate on which you can jot gear changes in pencil will keep you posted on what is set up.

Engrave or stamp gear designations on the plate. Make a matte writing surface with fine abrasive cloth or abrasive powder. Mount under any convenient bolt.—Walter E. Burton, Akron, Ohio.

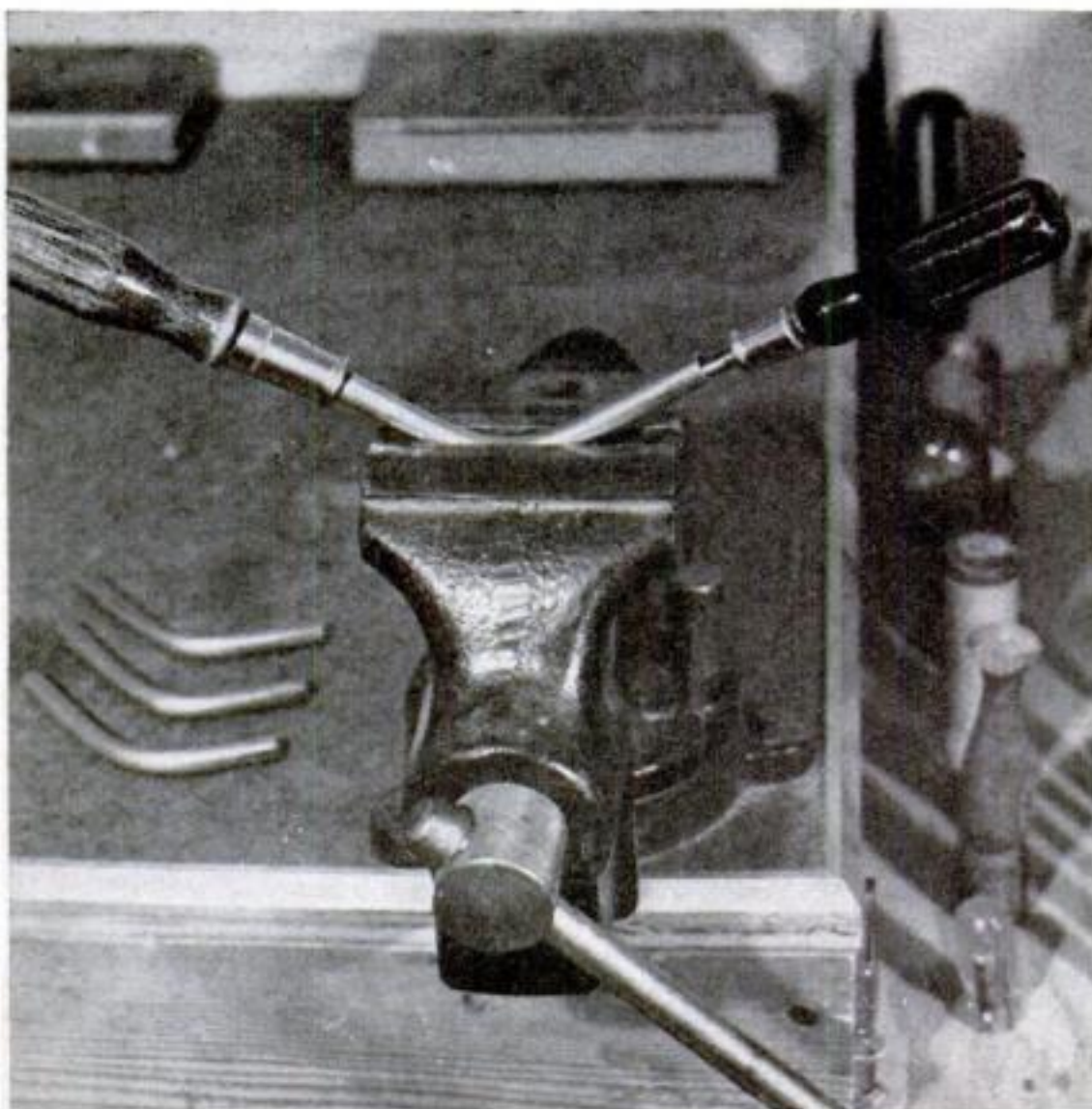
More Shop Tips



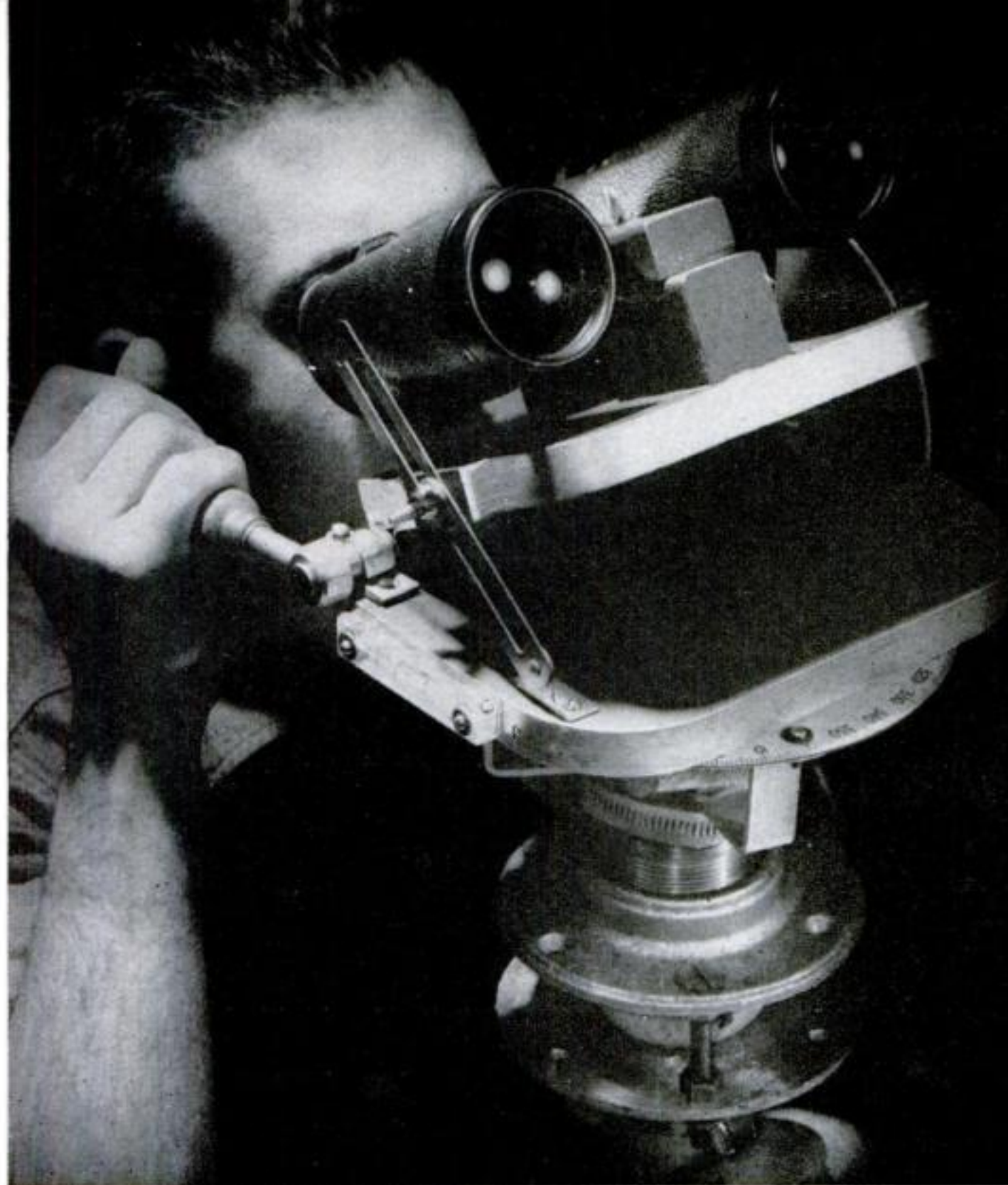
Gear Segments Grip Tapers. One of the handiest vise accessories I have in my toolbox is a pair of segments that were cut from a thick spur gear. Placed between tapered work and the movable vise jaw, they automatically roll into position as the jaw is tightened and clamp the taper. They hold all sorts of tapers, even round ones such as lathe centers, and can be used in any machine or bench vise.—*H. J. Gerber, Stillwater, Okla.*



Shop Charts Roll Up. Reference charts or blueprints are neatly stored in small space on a roll-up rack like this. Cut old roller shades to uniform length. Mount them directly on a wooden wall, or on pieces of wood for fastening to masonry. Tape the reference sheets to the shade cloth. Mark the contents of each roller on the outer turn or on the mounting board. For use, simply pull down the roller.—*Randolph Lucas, Richmond, Va.*



Tube-Bending Tip. To make a smooth bend in a small piece of copper tubing without first filling it with sand, use your vise. Clamp the piece horizontally, tightening the jaws just enough to hold it. Insert screwdriver shanks, keeping the tips well away from the bend. Then grasp the screwdriver handles and put one thumb down where the bend is to be formed. Bend up with both hands. Properly adjusted, the vise jaws should let the tubing bend but not spread or buckle. With longer pieces of tubing, you won't need screwdrivers.—*Hall Taylor, Santa Rosa, Calif.*



How to Make Your Satellite Spotter

This sturdy mount will enable amateurs to track artificial moons with ordinary binoculars.



By Harry Walton

WITH a binocular stand that you can make mostly from pipe fittings, you can get ready now to spot the artificial earth satellites that scientists are planning to launch.

It's even possible that you—or some other amateur—may be first to see a satellite after it is fired. Although its course is precalculated and batteries of elaborate cameras will be trained on it, it could plunge into a different orbit than the planned one. Should this happen, it may not pass within sight of the official observing stations. Amateur spotting might then be the only means of tracking the satellite visually in its early orbits.

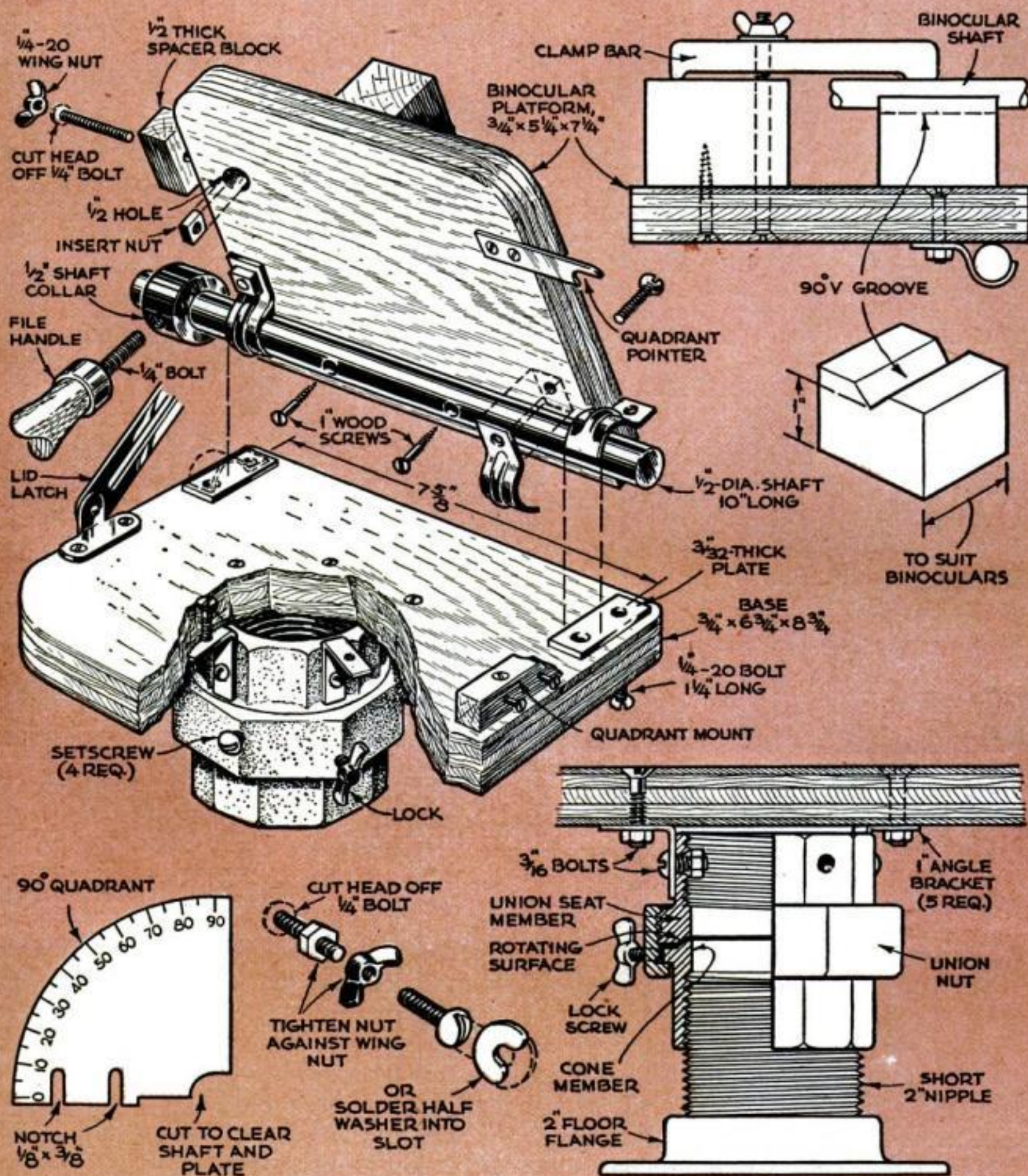
Why build it now? Experts in charge

of tracking the satellite want the help of amateurs. Says Dr. Fred L. Whipple, Director of the Smithsonian Astrophysical Observatory, "The importance of amateur astronomers in the project can hardly be overestimated."

But to find, identify and follow a tiny object moving at 18,000 m.p.h., hundreds of miles up, you will need practice. Now is the time to start getting it. You'll be able to make yourself a trained observer by watching stars, following planes and tracking free balloons if you equip yourself properly now.

Binoculars will show it. To get a spectator's seat for man's first venture into space, you need no costlier optical equipment than a pair of 7 x 50 binoculars (PSM, May '56, p. 110). But because

How the mount can be built with ordinary hand tools



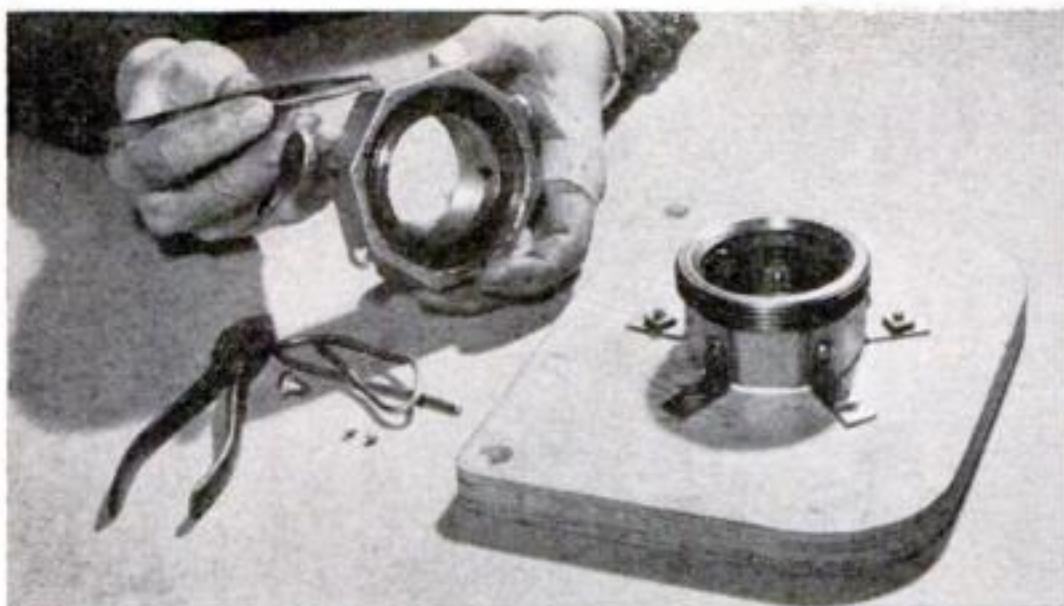
the tiny man-made moon will be moving fast—it will pass through the binocular field in seven seconds—some means of holding the glasses as steady as possible is an absolute must.

Of course this support has to be movable, so that the binoculars can be trained on the right sky area and swept

to follow the target as it swings on past.

The PSM spotting mount shown above is easy to build from common pipe fittings and hardware parts. To make it, you need only hand tools—plus a single $\frac{1}{4}$ "-20 tap (available in dime stores) and a tap wrench. No machining is necessary.

Besides holding the binoculars steady,



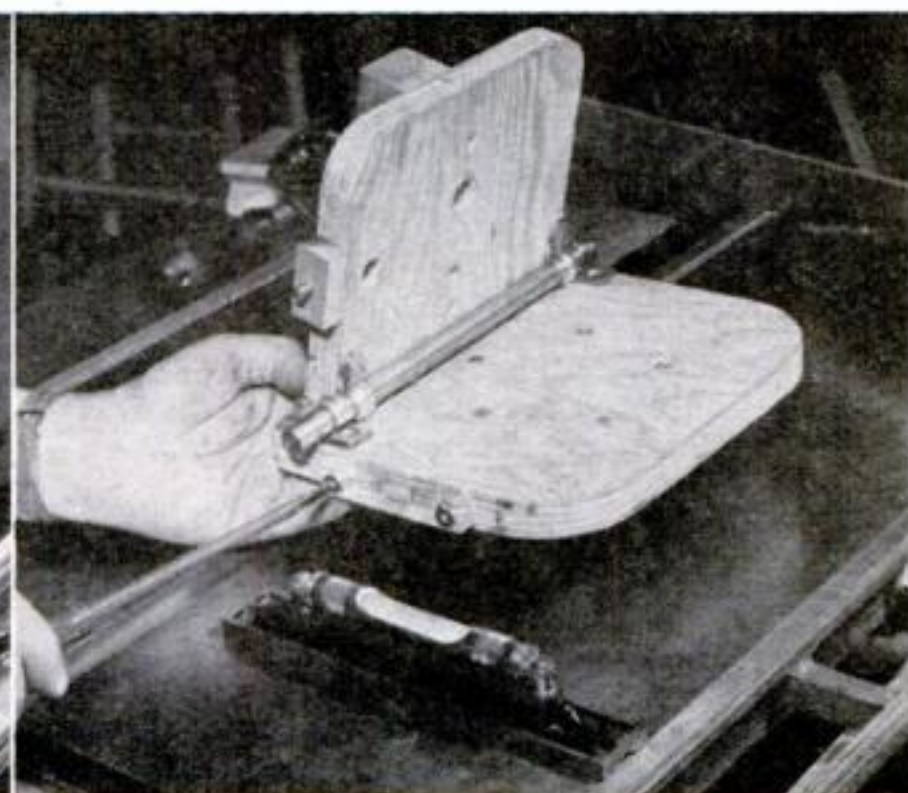
CUT SHORT BITS of solid wire solder and drop one under each setscrew. This protects the union threads on which the screws clamp. The knurled lock screw shown was from an old case-ment lock, but a wing screw could be used. Mount union seat on the base with brackets.



TO GET BASE EXACTLY LEVEL, put the union seat on a flat surface and check height of the corners of the base with a pencil clamped to a square, using paper under the pencil point. Then loosen the bracket screws and adjust the base until all of the corners check out at an equal height.



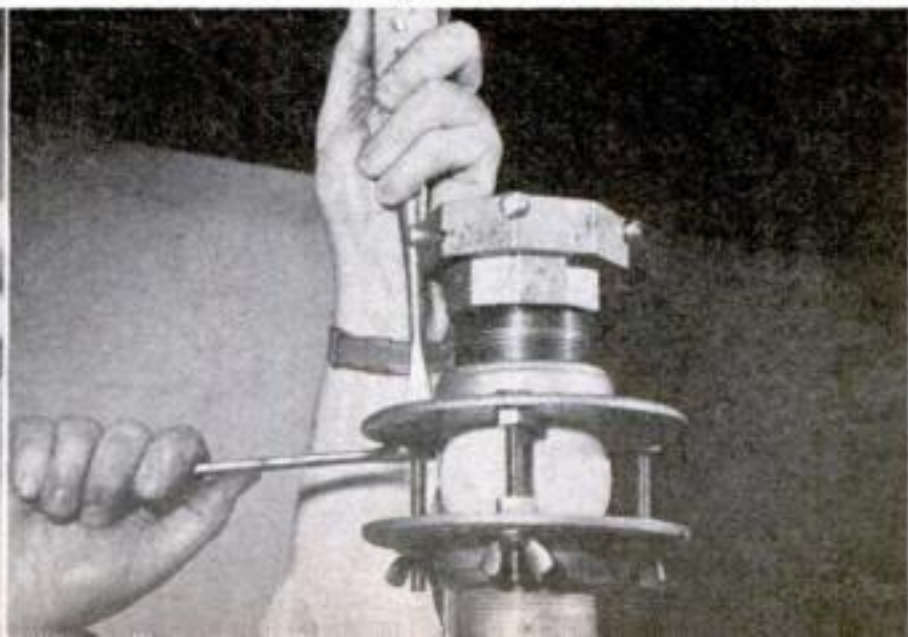
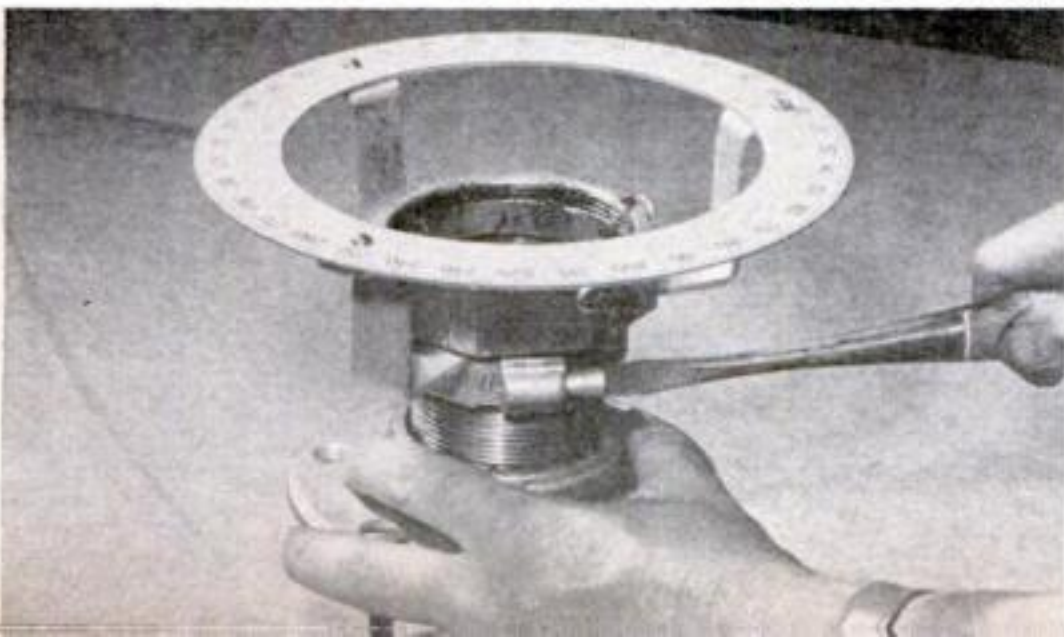
TILT SHAFT TURNS in heavy-duty BX clips on top of iron rub plates. Level a flat surface accurately. With the union seat on it, place a level on the shaft as above (only one level is needed). If shaft is not level, shim up the low end with tin-can strips under the rub plate.

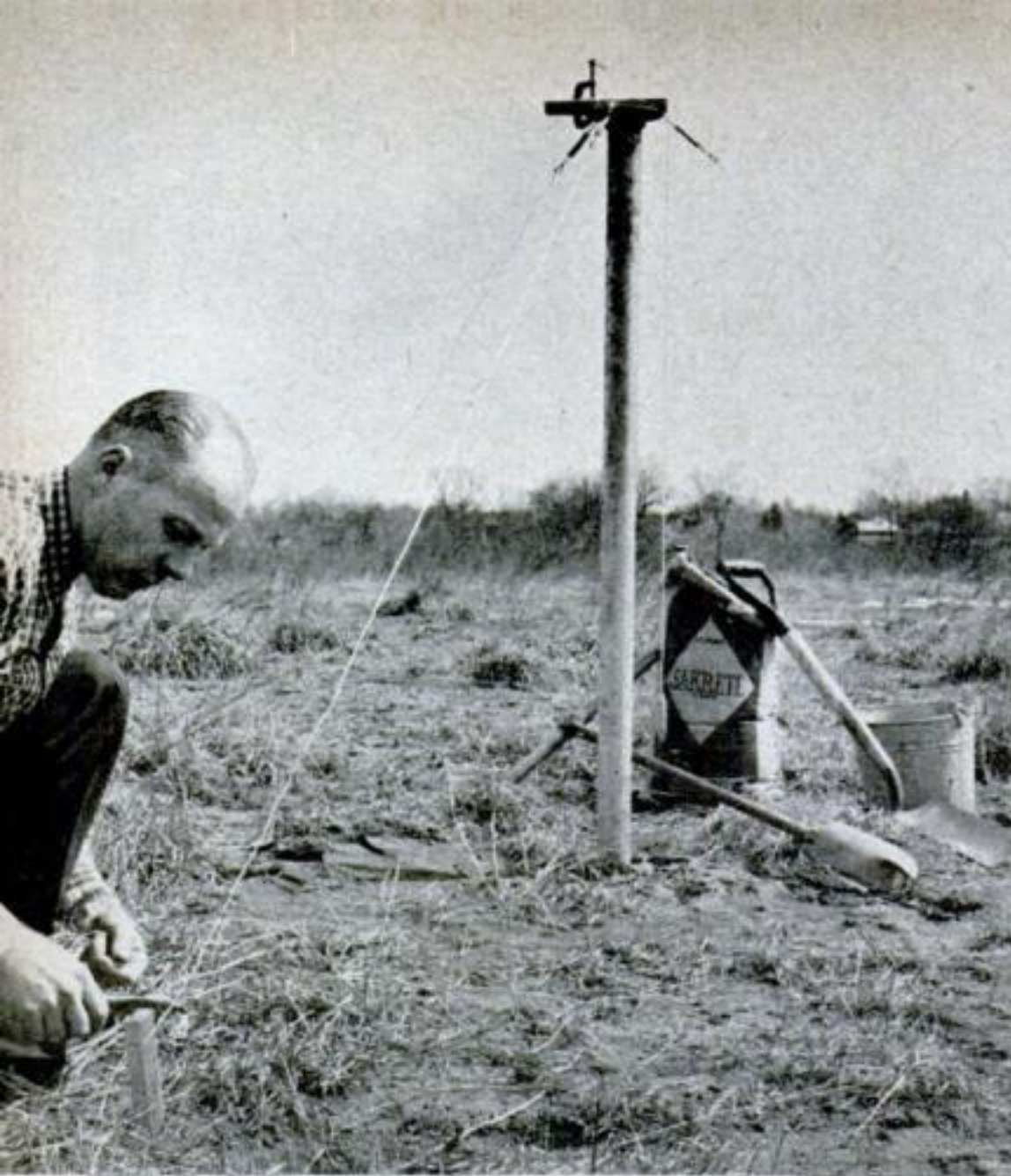


TURN THE BASE at right angles on the same leveled surface and fasten a line-level bubble to the right-hand edge, adjusting it to read level. Twist a $\frac{1}{4}$ "-20 bolt into a file handle and tighten it into a shaft collar as in the drawing to bear on a flat filed on the shaft.

BEND THREE BRACKETS from stiff brass or aluminum to lie against flats on the lower union member and hold the compass ring $\frac{1}{4}$ " below the base. Drill ring-mounting holes oversize for 6-32 screws to allow adjustment. Fasten the brackets to the flats with a big hose clamp.

ASSEMBLE THE UNION, a short pipe nipple, and a 2" floor flange. Screw a second flange onto the pipe post. Place a rubber ball between and join the flanges with $\frac{3}{16}$ " bolts (three in six-hole, four in four-hole flanges), with two nuts between flanges and a wing nut below.





DRIVE THREE STAKES around spot chosen for the post, set it into the hole, and rig wires to the stakes from turnbuckles hooked into flange holes. Adjust length of the wires to hold post reasonably plumb with turnbuckles slack. Fill hole around post with stones and cement.



SUSPEND A PLUMB BOB from one flange hole and measure distance from post to cord at the top. Then adjust turnbuckles (while cement is still soft) to bring cord equally distant from lower part of post. Check by repeating with plumb bob hanging 90° around from first position.

this mount allows them to sweep a full 360° horizontally and to tilt upwards to 90°. Both of these movements are smooth and free of play. An azimuth ring will give you horizontal bearings relative to true north. A quadrant will read vertical angles of elevation. With these, you should be able to find the satellite's position. Maps showing when and where it can be seen in your vicinity will probably be printed in newspapers.

The original PSM spotting mount shown on these pages has been examined by Dr. Whipple. It is, he says, "an ingenious and practical means of equipping the amateur for effective satellite observation."

Post and all, the parts should cost no more than \$12 or \$13 if bought locally. You can shave this figure by using secondhand pipe or lumber for the post. Most of the parts are also available from general mail-order houses.

It turns on a union. The horizontal bearing is formed by the ground sealing

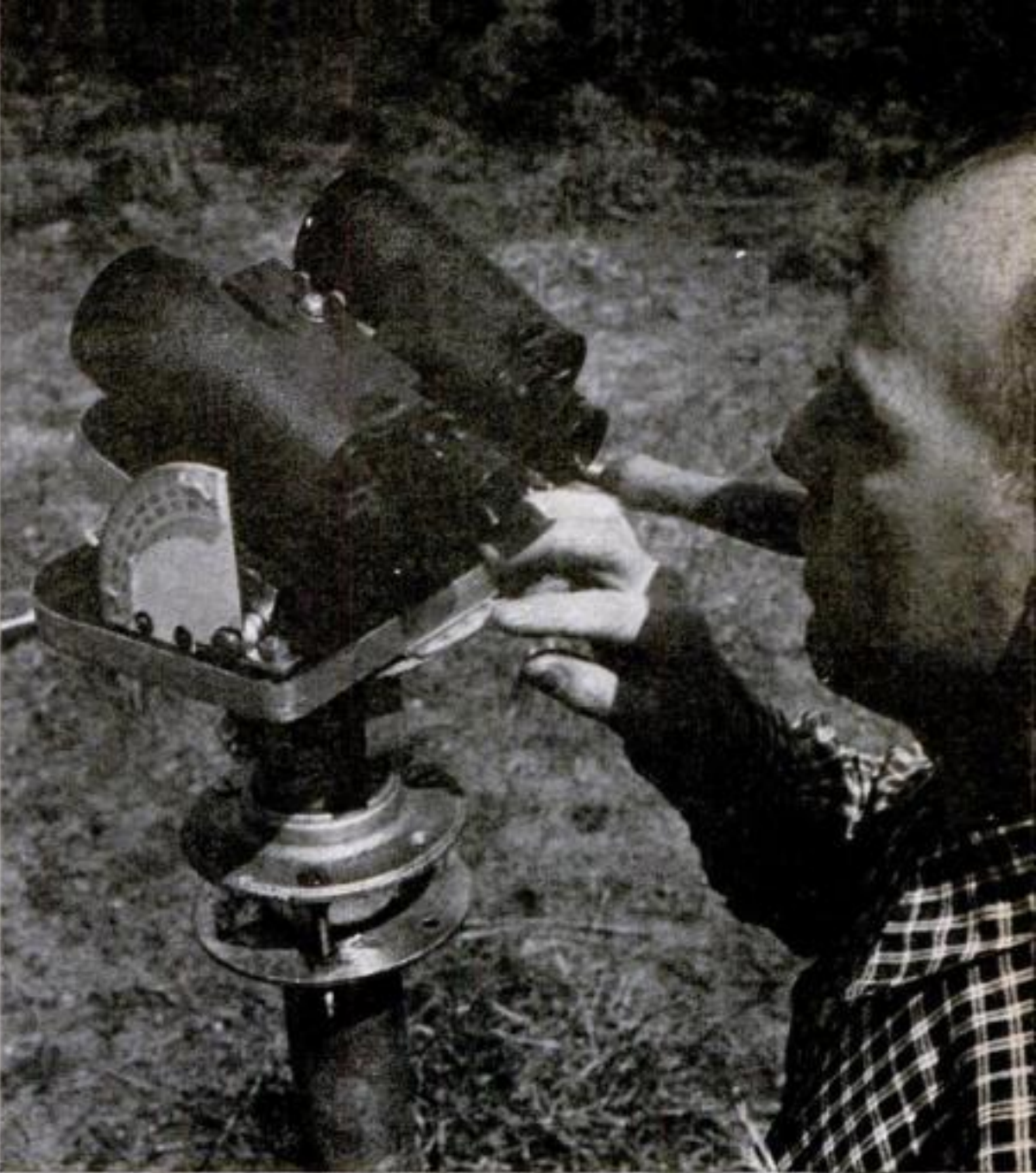
surfaces of a 2" pipe union. This fitting consists of three parts. Two are threaded to screw onto meeting pipes.

The third part is a big ringlike nut that seats against a flange on one part and screws onto the other, thus pulling the two together. Fitted with setscrews, this nut can be locked at a point that leaves the sealing surfaces free to turn, but without wobble.

Punch-mark four corners (not flats) of the union nut $\frac{1}{4}$ " from the end of the thread. Drill No. 7 holes on the marks and tap the holes for $\frac{1}{4}$ "-20 screws. Lubricate the tap and turn it in slowly, taking particular pains to start it parallel to the drilled holes.

Take only about half a turn at a time, backing out a trifle each time to free the chips. Tap all four holes right through the wall of the nut.

Drop the coned member into the nut. Then, with a depth gauge or a strip of paper, measure the depth at which the rim of the cone rests in the nut. Punch-



MOUNT THE HEAD with compass ring zeroed on due north. Turn wing nuts to center the bubble (ball provides springy support for adjustment). Rotate head 90° and level again. Re-check first position. With head leveled both ways, tighten nuts on top of lower flange.

COMPASS RING projects slightly beyond the base. File a piece of brass to a point, bend as required, and fasten it to the edge as a pointer. Or attach a flat piece of clear plastic, with an indicator line scratched on it, to the underside of the base as shown in the picture above.

mark a corner of the nut (between two setscrew holes) $\frac{1}{8}$ " below this point. Drill and tap there for the screw that will lock the horizontal movement.

Mount base with brackets. Hold a 1" angle bracket against one flat on the union member that has a beveled bronze seat. Mark through the hole in the bracket. Then place the beveled seat down on a flat, smooth surface such as a piece of plate glass, part of a flat auto windshield, or a circular-saw table.

With a pencil clamped to a block of wood or a try square, mark every other flat at the same height as the first. Punch the center of the five flats on these marks. Drill $\frac{1}{4}$ " holes and attach 1" brackets with $\frac{3}{16}$ " bolts and nuts. (The holes in the two legs of the brackets may be differently spaced, so compare them and mount matching legs to the union.) Draw diagonals on the wood base, center the union where they cross, and spot through holes in the brackets for bolts to fasten

Satellite Model Now Being Shown in Department Stores

A FULL-SIZE model showing how an earth satellite may look, built by a member of POPULAR SCIENCE MONTHLY's staff, is being shown now as part of "The American Dream Historical Pageant." This pageant is touring the United States this summer. It can be seen June 4 at the Bon Marche store in Seattle. It will

arrive for display at the L. S. Donaldson Co. store in Minneapolis on June 11; at The Emporium in St. Paul on June 18; at Younkers in Des Moines on June 21; at Gold's in Lincoln, Neb., on June 25; at the Brandeis store in Omaha on June 28; and at the Younkers-Davidson store in Sioux City, Iowa, on July 2.

them. Drill, countersinking on one side.

Platform tilts up. Cut another piece of plywood to mount the binoculars on. To secure, cut a hardwood block as in the drawing. Saw a 90° notch in the top of it for the center shaft of the binoculars to lie in. Glue and screw this notched block to the platform.

Put the binoculars in to locate a second block, with a long ¼"-20 bolt passing through it for a clamp nut. Shape a hardwood clamp bar to bear on this block and pinch down on the center shaft of the binoculars.

As an alternative, you can buy a clamp made for holding the glasses on a camera tripod.* Costing \$2.50, it ought to be a cinch for you to mount, requiring only a ¼"-20 bolt through the platform.

You may find that the glasses can be seesawed in the notch even with the clamp tight. This should have no effect on sighting, but it can be eliminated by fitting blocks under the barrels. Size these blocks to hold the eyepieces at your own eye spacing.

Cut a piece of ½" shafting 10" long and fasten it to the platform with two wood screws and two heavy-duty ½" BX clamps held by ¼" bolts. Pivot it on the base with two more bolted clamps and two iron plates cut from a thick angle bracket.

Set these clamps close enough to the first ones to prevent end play. File a bevel on the plywood if necessary to clear the plates and allow the platform

to tilt fully 90°. Mount a cabinet-lid support as shown to lock the platform at any desired elevation. (This will be helpful if you and your friends cooperate by

forming a team to spot satellites, but it may be omitted.) On the other side, fasten a small cleat to hold the elevation quadrant.

Fitting the scales. You can lay out an azimuth ring marked off in 360° divisions on plastic, metal or cardboard with a protractor. An 8", 360° drafting protractor made of plastic can be had for about \$3. Or you can purchase the ring and the quadrant together,

made of aluminum, by mail for about \$2.50.* Notch the quadrant edge as in the drawing to mount it with wood screws and washers; the intersection of its 90° angle should be dead on the tilt-shaft center.

Grease the rotating surfaces of the union joint, assemble it, and tighten the nut to make it turn rather stiffly. Use care in drawing up the setscrews; pulling one or two up hard can distort the nut and cause sloppiness in the pivot. Tighten all four a little at a time until snug.

Drive a long, thin brad into the rear edge of the base so that the end lies just above the edge of the azimuth ring. Then swing the mount about, adjusting the ring until the nail runs concentric to it.

Setting up the mount. Making allowance for the leveling head shown, the post should be high enough to bring the binocular-eyepieces slightly above your eye level (making it easier to use them tilted up). Set the 2" pipe into concrete and plumb it as in the photos. **END**

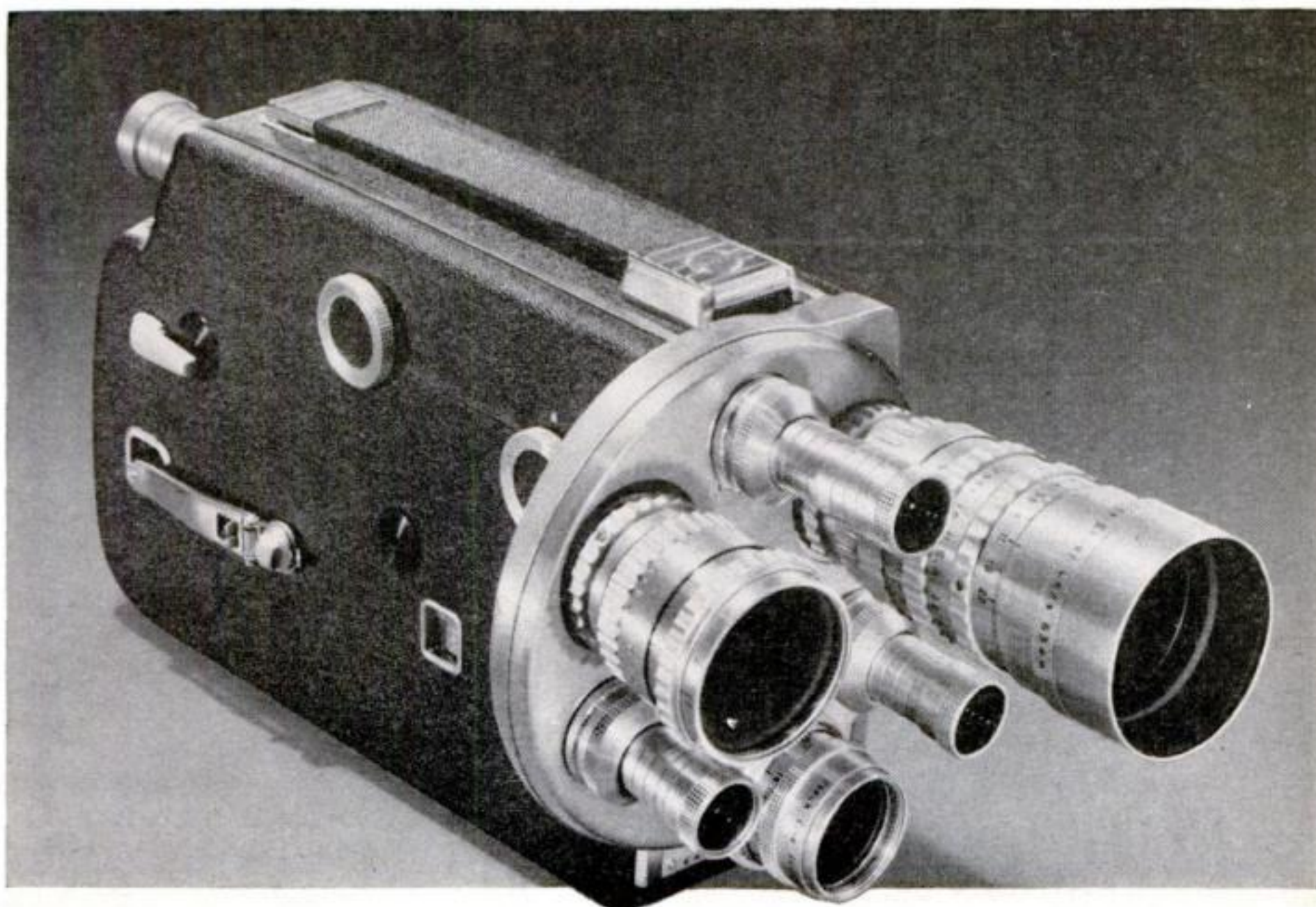


IN HARVARD OBSERVATORY, PSM's binocular mount is studied by Dr. R. E. McCrosky, Research Associate.

*Azimuth ring, quadrant, and binocular clamp available from Floyd McGuckin, 314 N. Monroe St., Ridgewood, N.J.

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"The attempt to launch the earth satellite represents man's most important scientific venture in recent time," says Dr. Lloyd V. Berkner, president of Associated Universities, Inc., which operates

the Brookhaven National Laboratory for the U.S. Atomic Energy Commission. For further news of this exciting project, and how you can take part in it, see future issues of POPULAR SCIENCE MONTHLY.
.....



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how much film can be exposed before re-winding, how much unexposed film remains on the roll. Provision for hand crank (for producing multiple exposures, dissolves, special effects), and for attaching electric-motor drive. K-100 Turret Camera with superb Ektar II 25mm Lens and matching viewfinder, from \$315. See it soon!



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24% more road horsepower—for passing!

Champion introduces a great new spark plug

Tests prove new Champions give big power boost to cars that have gone about 10,000 miles without a spark plug change. If you haven't changed your plugs recently, put in new Champions—and feel the difference immediately!

You just can't imagine what a difference new 5-rib Champions can make in your car's actual road horsepower.

But this difference has been proved—without a shadow of a doubt—in tests conducted by one of the country's largest independent research centers. Regular passenger cars whose plugs had gone roughly 10,000 miles were tested first with their regular plugs; then with new Champions.

Nothing about these cars was changed except their spark plugs. Yet there was an immediate increase in their road horsepower—the real power actually delivered at the rear wheels!

Some of the results were spectacular.

plugs had gone 10,000 miles actually showed a gain of 72.5% in road horsepower! A 1954 V-8, whose plugs had gone 12,000 miles, got a boost of 53.5%. Some cars, of course, showed smaller gains; 20% in the case of one 1955 V-8 and only 6.5% (the smallest gain) in another. *But the average road horsepower gain for all cars tested was a fraction over 24%!*

And what a difference these new plugs can make in your car's starting! Tests show Champions reduced starting time by as much as 71%—with an average of 39% for all cars tested!

If you haven't changed plugs recently, it's high time to install new Champions. Whatever your car, these great new plugs give you



24% more road horsepower—for the straightaway!

Quicker starts, too—39% quicker!

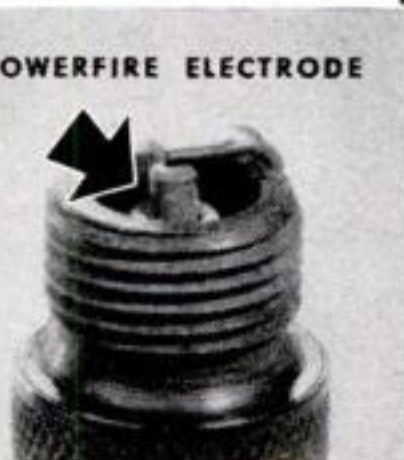
-it can increase road horsepower by 24%!

SEE HOW MUCH BETTER AND LONGER NEW CHAMPIONS
STAND UP IN TODAY'S HIGH-POWER ENGINES

ORDINARY ELECTRODE



POWERFIRE ELECTRODE



New Powerfire electrode makes the difference! Both of these spark plugs have been subjected to identical use in a modern high-compression engine. You can see the old style electrode (left) is badly pitted and burned away. Plugs like that in your car often misfire . . . waste power and gas. Champion's new Powerfire electrode (right) is still able to give many more miles of powerful, economical performance.

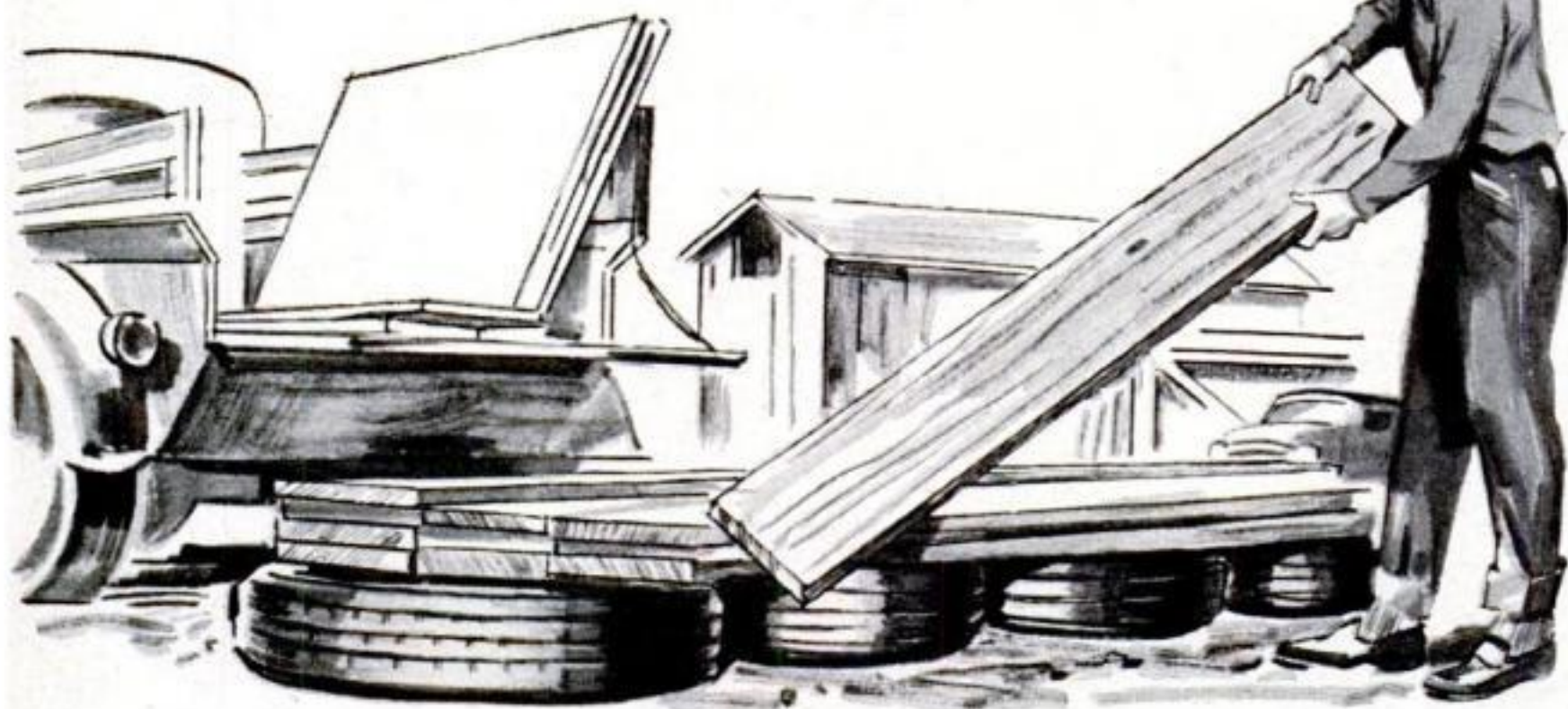


CHAMPION

LOOK FOR THE 5 RIBS

Base of Old Tires Protects Lumber Pile

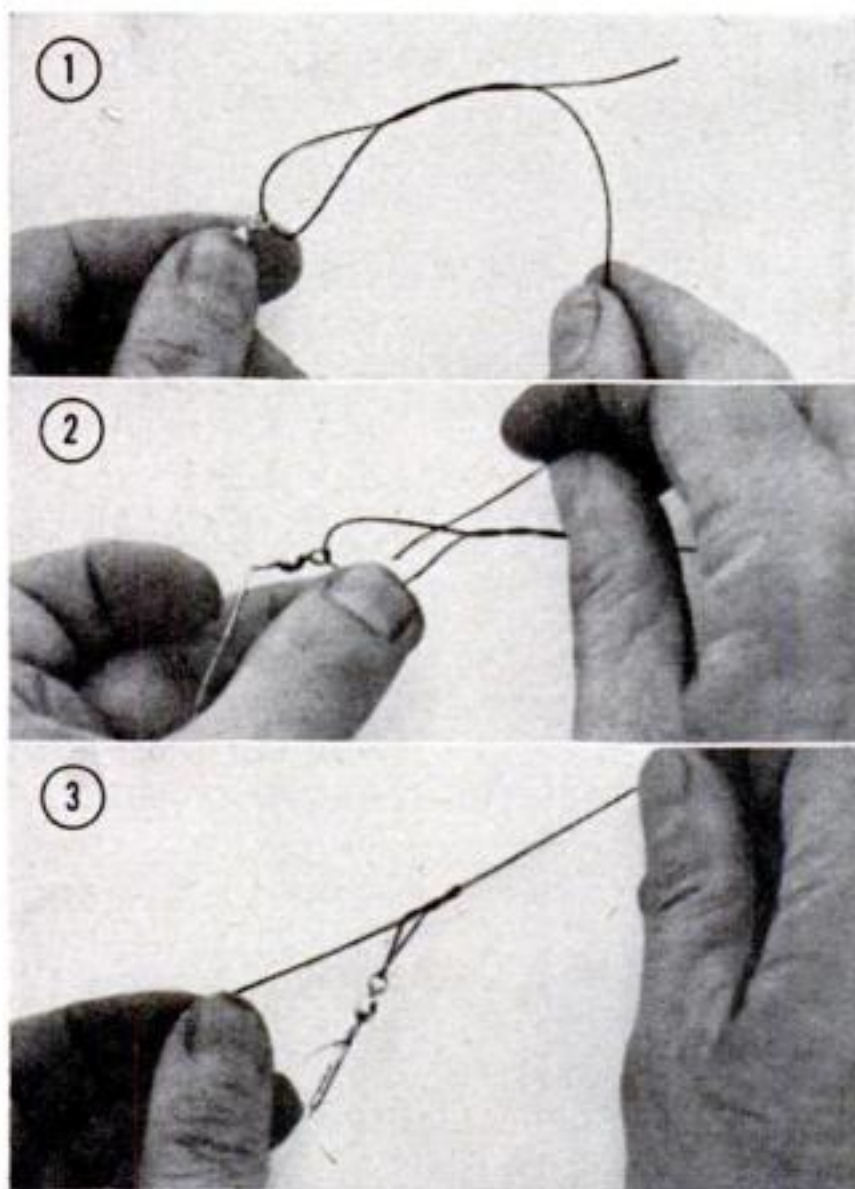
ONE way to keep lumber off the ground, where it absorbs moisture, is to stack it on a row of old tires. This lets air circulate under it.—*Alexander Owen, Schenectady, N. Y.*



Pillbox Dispenses Stamps

STAMPS roll out of this dispenser (above) made from a plastic pill container. Cut the slit in the side with a sharp knife heated over a flame for a few seconds. If you have one of the taller bottles, several different rolls will fit.

▶▶▶ WHEN filling plasterboard joints, I find that a thin coating of glue size between applications of joint cement gives me a smoother finish. The size stops absorption of moisture by the first layer and makes the second coat easier to spread.—*L. Ciomei, Chicago.*



Simple Knot Holds Fishline

ONE of the easiest knots to tie is also one of the best to hold a hook, lure or leader on a fishing line. Put the end of the line through the eyelet and wind it three or four times around the main line (1); insert it through the loop (2); pull tight (3). Snip off the excess.—*George C. Mattis, Birchwood, Wis.*

Men with mechanical skills: measure yourself against this yardstick



Mechanics Creed

Upon my honor I swear that I shall hold in sacred trust the rights and privileges conferred upon me as a certified mechanic. Knowing full well that the safety and lives of others are dependent upon my skill and judgment, I shall never knowingly subject others to risks which I would not be willing to assume for myself, or for those dear to me.

In discharging this trust, I pledge myself never to undertake work or approve work which I believe to be beyond the limits of my knowledge; nor shall I allow any superior to persuade me to approve aircraft or equipment as airworthy against my better judgment; nor shall I permit my judgment to be influenced by money or other personal gain; nor shall I pass as airworthy aircraft or equipment about which I am in doubt, either as a result of direct inspection or uncertainty regarding the ability of others who have worked on it to accomplish their work satisfactorily.

I realize the grave responsibility which is mine as a certified mechanic, to exercise my judgment on the airworthiness of aircraft and equipment. I, therefore, pledge unyielding adherence to these precepts for the advancement of aviation and for the dignity of my vocation.

This challenging creed has made the U. S. Air Force the finest technical service in the world. If you are a man who feels a deep sense of satisfaction from the knowledge of a job well done, the U. S. Air Force offers you a rewarding and exciting life. Skills you acquire in the Air Force will help you choose and succeed in your future career.

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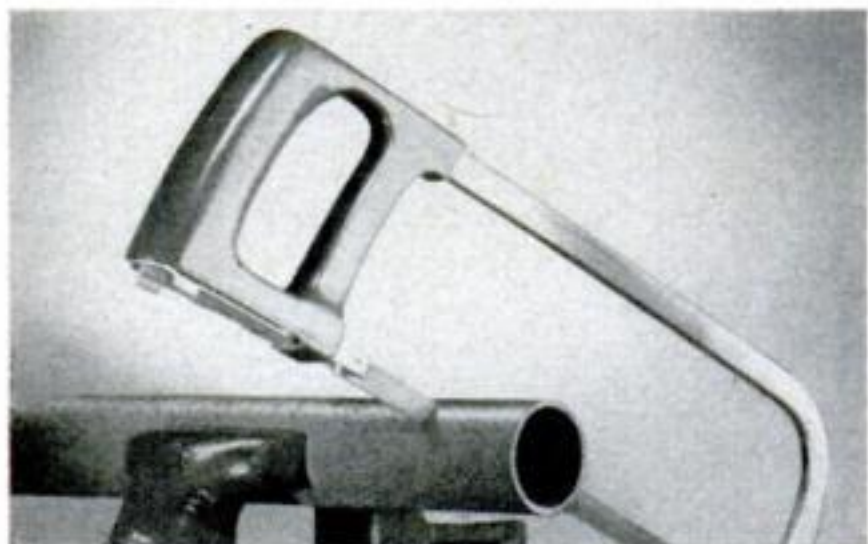
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City _____ Zone _____ State _____

New Tools

1. Jigsaw Moves in Orbit. The blade on this portable saw cuts only on the upstroke, releases and then backs away on the downstroke—resulting, the maker says, in less blade breakage and extended sharpness. In addition, you can plunge cut without drilling a starting hole and saw through a full 2" in wood, $\frac{3}{4}$ " aluminum or $\frac{1}{4}$ " steel, and also cut plastics. An accessory base that is available lets you do angle cutting.

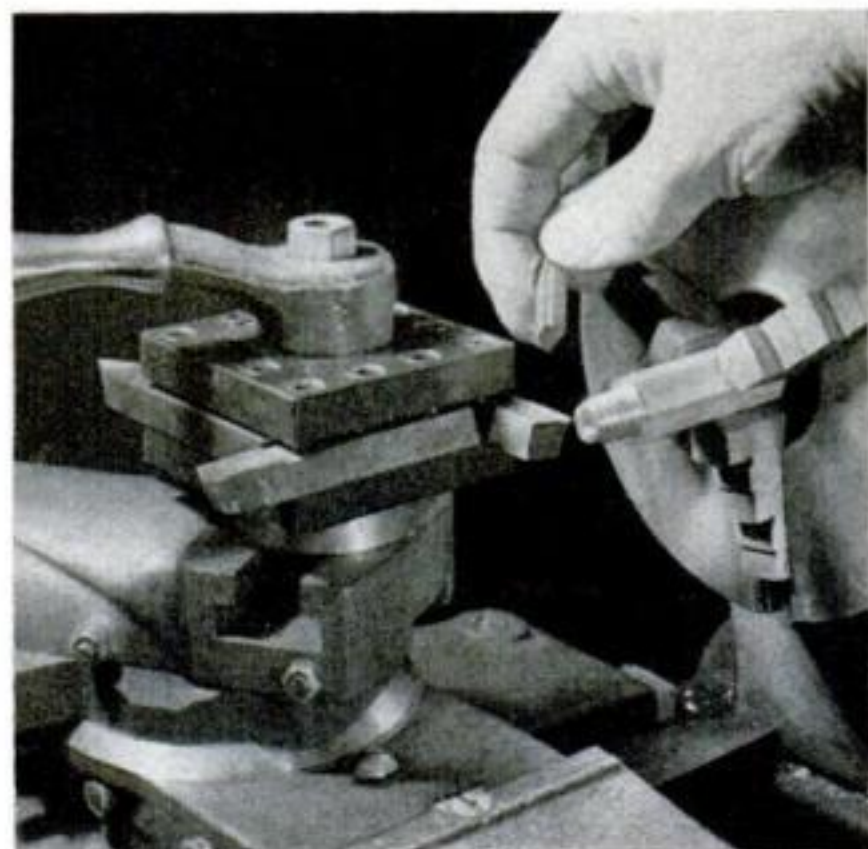


2. Hacksaw Molded in One Piece. A plastic handle molded directly onto the steel frame makes this a durable hacksaw for use in close quarters. It takes a 10" or 12" blade and has a lever-lock.

3. Gauge Checks Drill Point. Here's a drill point gauge that takes the guesswork out of drill sharpening and permits quick selection of the right drill. Two calibrated semicircular disks enable you to measure any cutting angle from 110° to 135° , point angle from 40° to 90° and clearance angle from 0° to 20° . Also included are a point center scale and illustrations that show how to use the gauge for checking angles.



4. Preground Lathe Bit. A chip groove and a hollow-ground side run the full length of this bit. Hence it can be used as a right- or a left-hand tool simply by turning it around. When dull, only the end is ground. It may be mounted in any holder or directly in the tool post. Both standard and heavy-duty bits are available in all sizes. A $\frac{1}{4}$ " alloy-steel bit is shown in the hand in the photo at left, and a $\frac{3}{8}$ " industrial bit in the four-position tool post.



More information about the tools shown on this page can be obtained from: 1. Porter-Cable, 69 Exchange St., Syracuse, N.Y.; 2. Clemson Bros., Inc., 20 Cottage St., Middletown, N.Y.; 3. Swanson Mfg. Co., 1236 Sherman Ave., Evanston, Ill.; 4. Tool-Craft Co., 109 Harvey St., Hackettstown, N.J.

Texaco Tips On Car Care

★ How to check your shock absorbers

Because shock absorbers are so vital to driving comfort — as well as control of your car — it's a good idea to check them regularly. Step on your car's bumpers and press down hard — as far down as they go. When you let go, the car should come up smoothly and rather slowly. If it bounces up sharply or vibrates up and down, your "shocks" should be either repaired or replaced.



THINKS
FOR
ITSELF!



★ How to increase engine life, driving economy

Use Havoline Special 10W-30, the all-temperature oil. When you start 'er up, it's *light* — for flash lubrication, fast getaways. Yet when your engine heats up, it has *body* — for protection against sizzling engine heat. Yes, *Havoline Special 10W-30* thinks for itself...saves you thinking about seasonal grades of oil. So change today, change regularly. Get *Havoline Special 10W-30* from your Texaco Dealer, the best friend your car has ever had!



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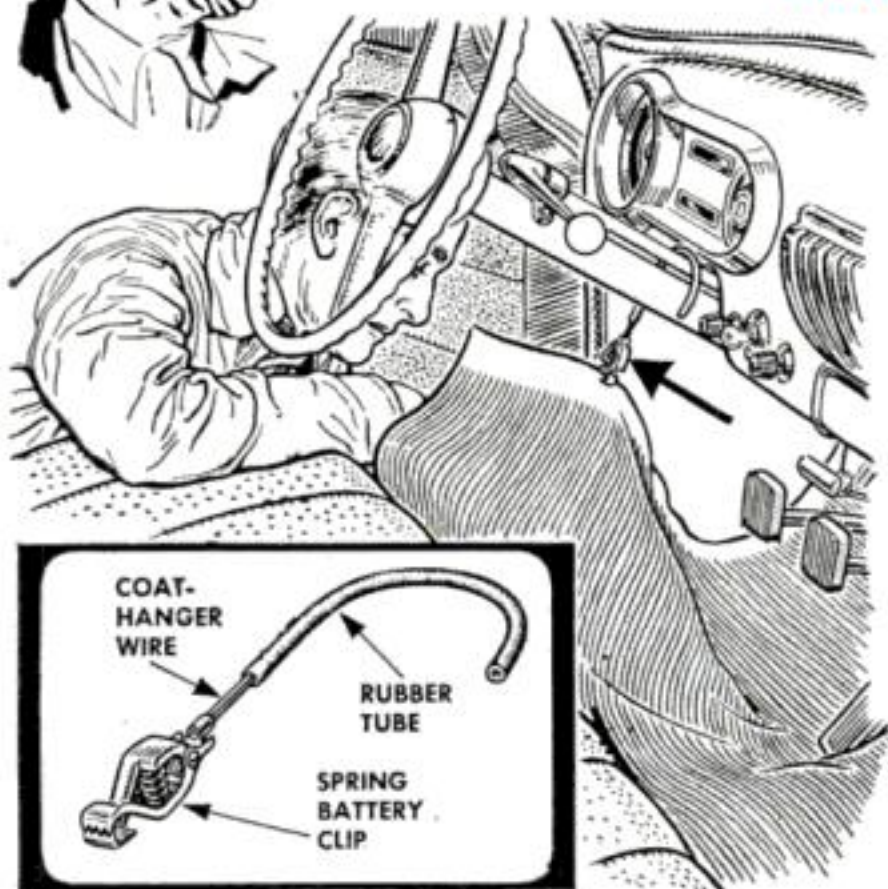
TUNE IN: TEXACO STAR THEATER starring JIMMY DURANTE, on TV Saturday nights, NBC.

JUNE 1956 205

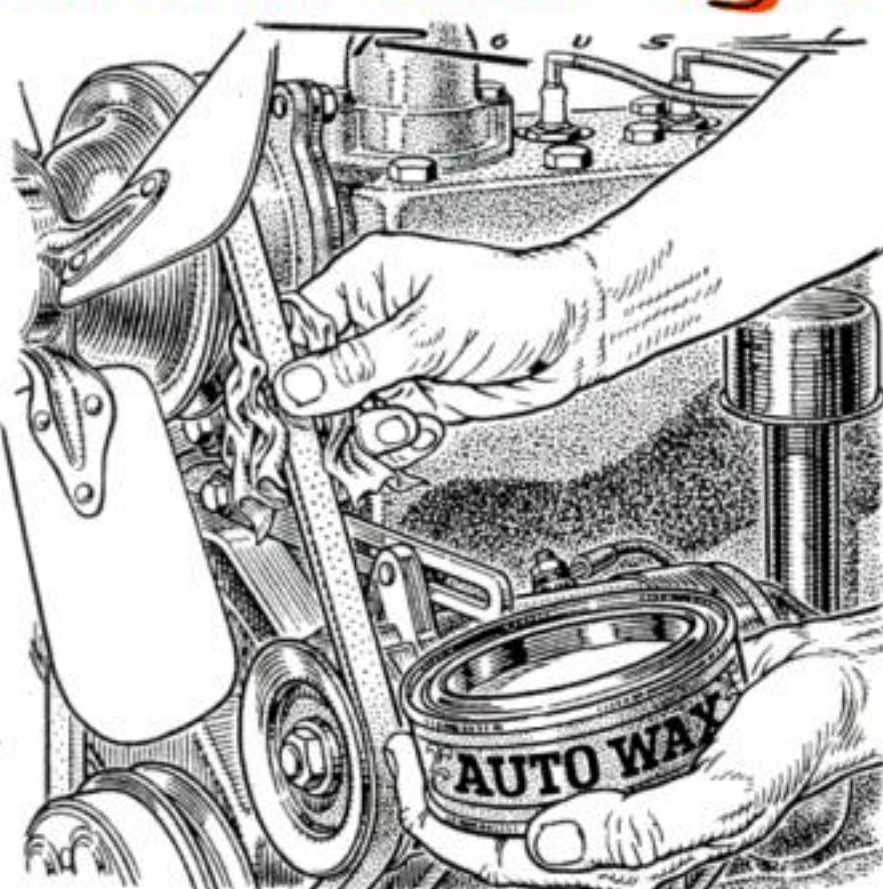
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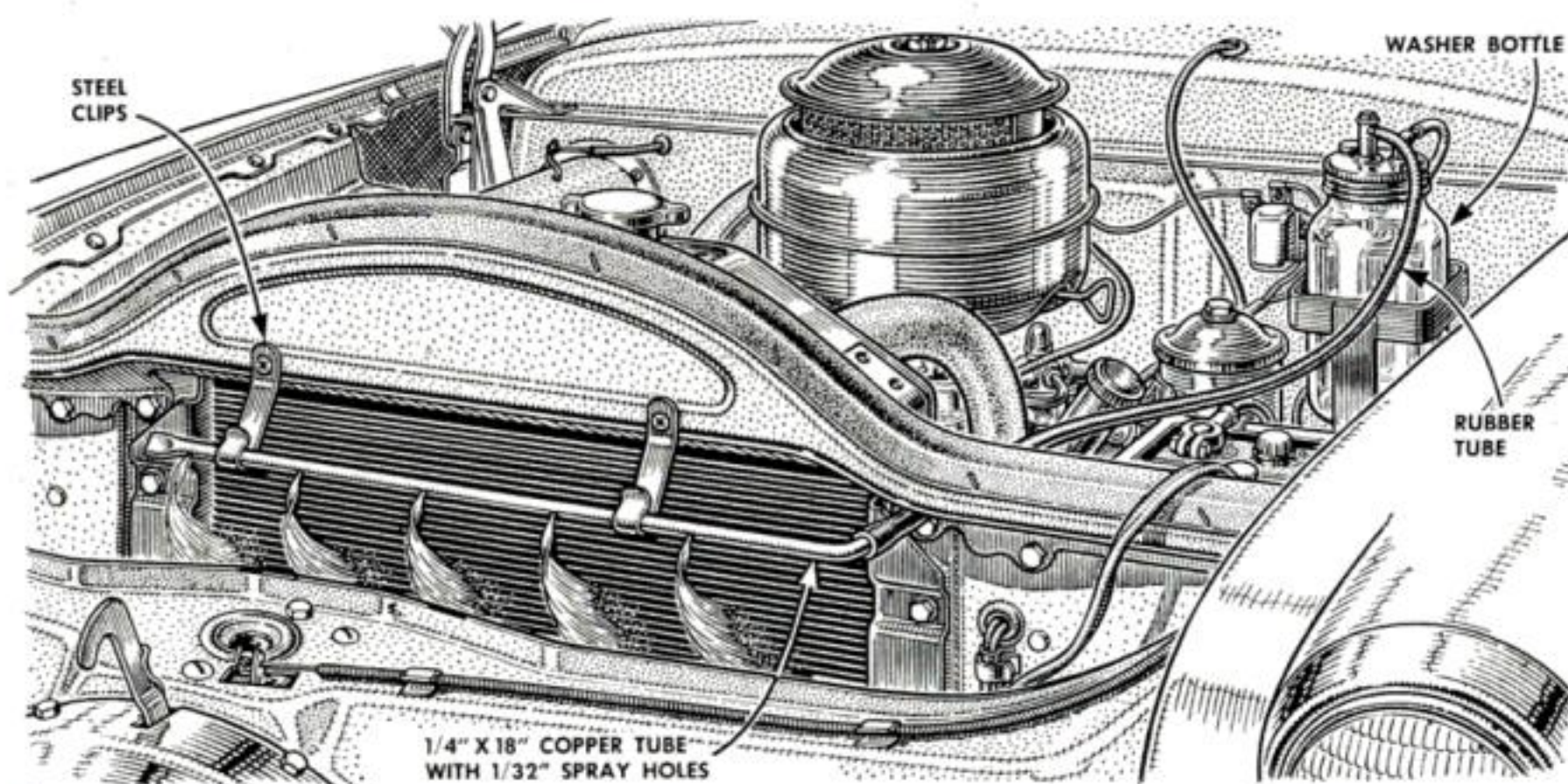
Hints from the Model Garage



A handy hook like this will keep the floor mat out of the way while a mechanic is servicing a master cylinder that is located underneath the floorboard. The hook will also help to prevent crimping and breaking of the floor mat.



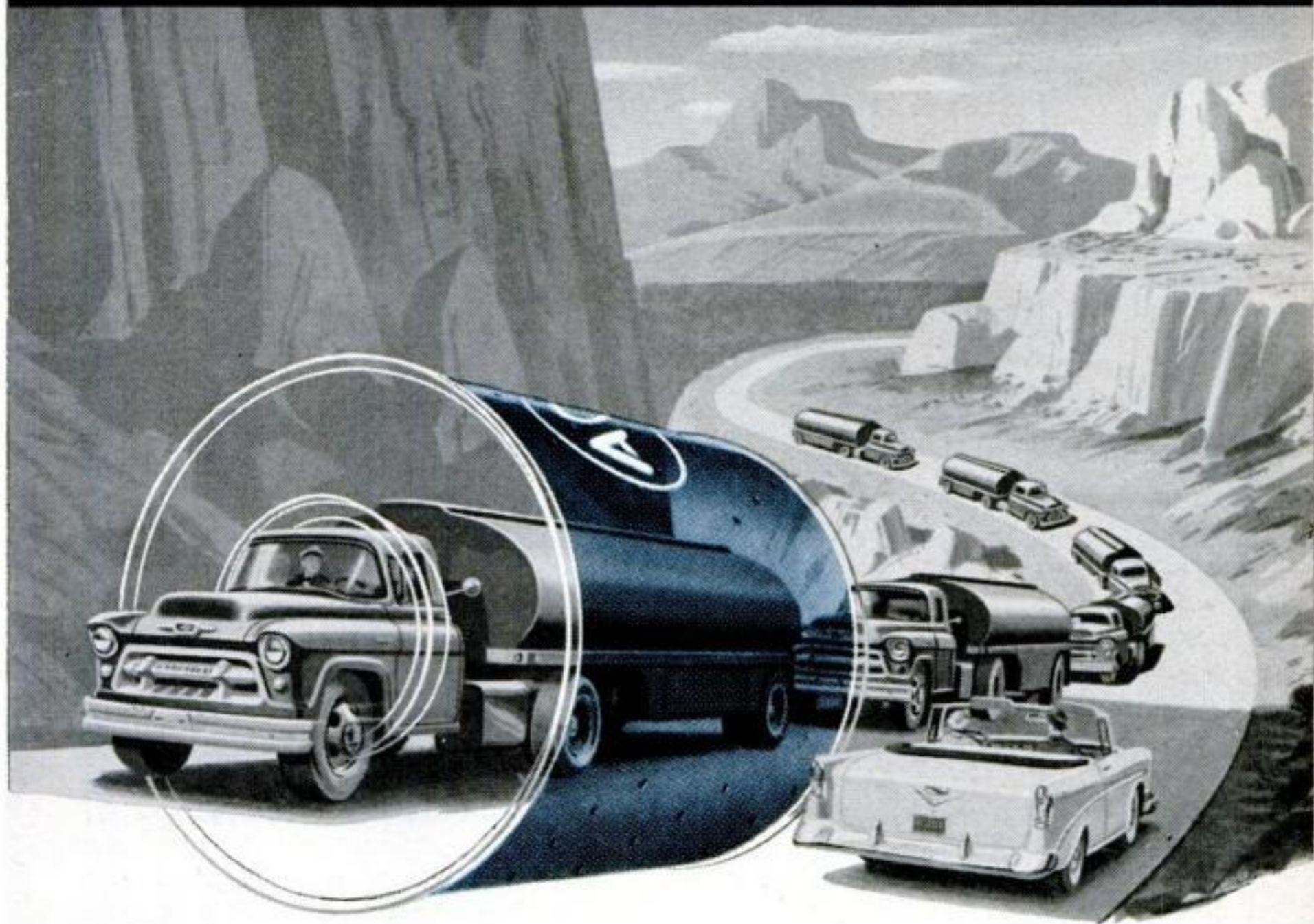
Fan belt squeak? One man who had been trying to quiet his for five years offers this tip: Use just a little auto paste wax on the inside surface of the fan belt. The wax doesn't seem to cause any noticeable slippage, he says.



A long pull on a mountain grade may cause an engine to overheat when you are towing a trailer. Spraying the radiator like this will help keep the temperature down. Drill five $\frac{1}{32}$ " holes in an 18" piece of $\frac{1}{4}$ " copper tubing. Fasten the tubing to

the radiator shroud with steel clips. Connect the spray tube and the outlet of the windshield-washer bottle with rubber tubing. Squirt water on the radiator each time that the temperature creeps too far above the normal heat range.

**SIX TANK TRUCKS of oil surge through
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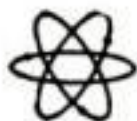
Here are the FACTS about the miraculous job done by a full-flow AC OIL FILTER

Every 30 seconds your car is running, all of the oil in the crankcase takes a cleaning trip through the oil filter. The magnitude of this filtering job—removing damaging bits of dirt, metal, grit and carbon from the equivalent of 36,000 gallons of oil every 5000 miles—calls for the qualities that are built into AC Oil Filters. Huge filtering area, specially processed filtering material and parallel packing of AC Oil Filters insure efficient, protective filtering over every mile of the recommended period between filter changes. You make a change for the better when you change to AC.

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AC SPARK PLUG

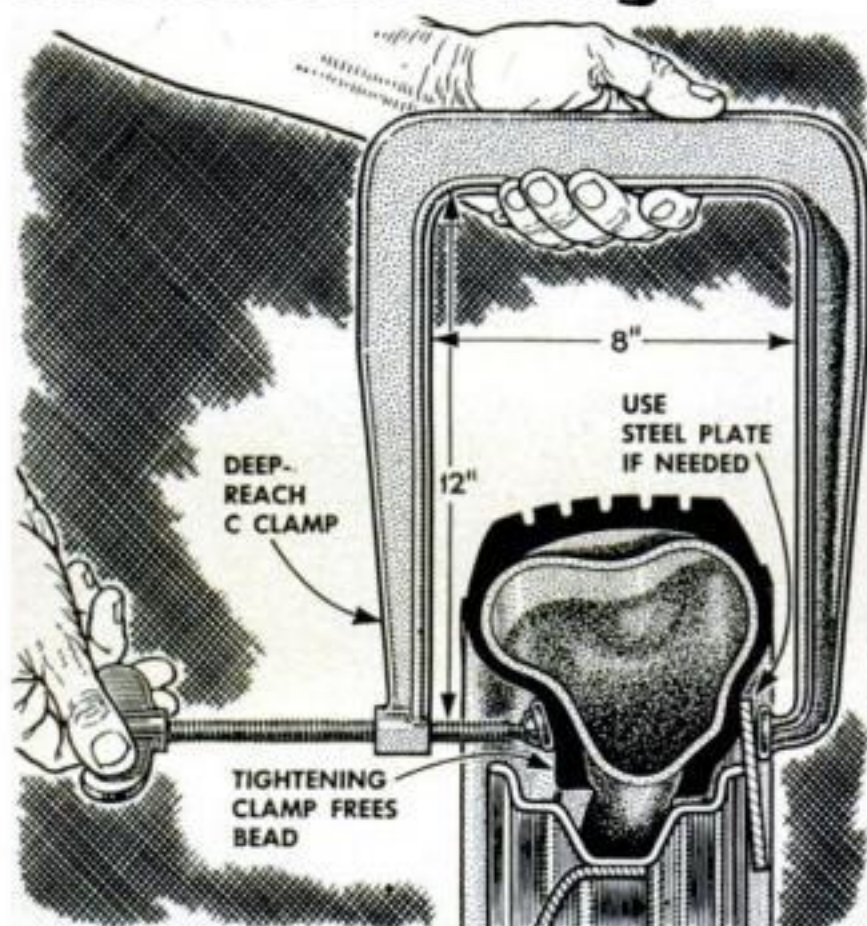


THE ELECTRONICS DIVISION OF GENERAL MOTORS

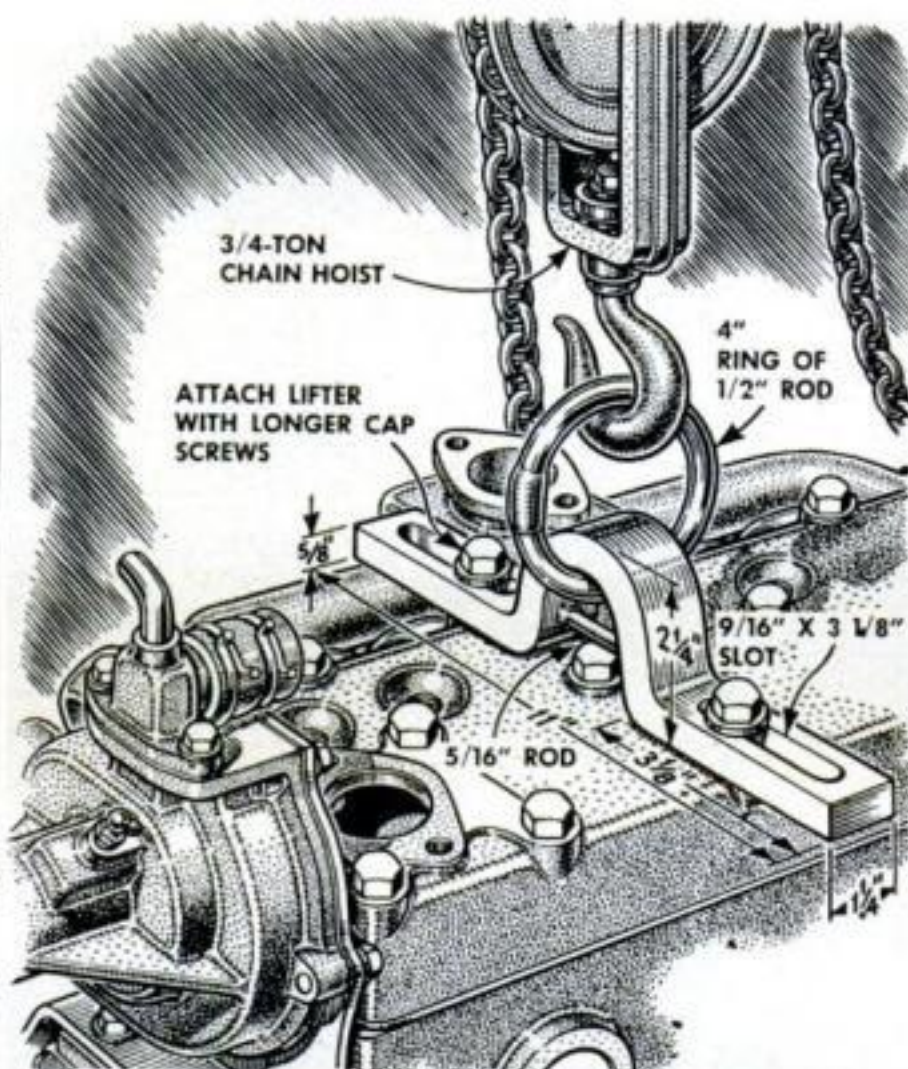
JUNE 1956 207

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More Hints from the Model Garage



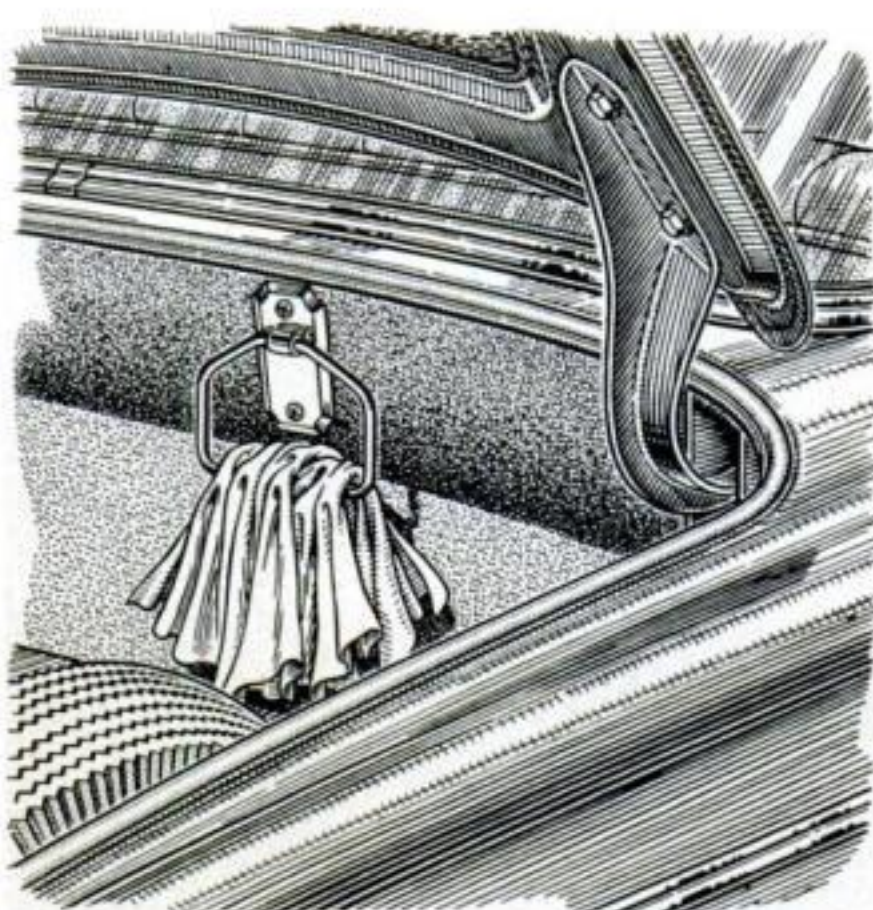
Bead stuck when you start to demount a tire? Here's one way to remove it—if you have or can borrow a deep-throated C clamp of about the dimensions shown. With clamp in place, turn screw to free one side. If the second side remains stuck, use a steel plate as in the drawing.



A universal engine lifter is what its developer calls this useful shop accessory. Slots make it possible to attach the lifter to a variety of engines: Merely replace two cap screws with longer screws. The lifter was bent to the desired shape from a bar of 5/8"-by-1 1/4" steel stock.



Evaporated milk is part of the stock in trade of one garage man. Poured into a radiator, it often stops small leaks. If the leak continues, the mechanic concludes that a radiator repair job is needed.



Do you use a polishing cloth on frequent occasions between washings to keep your car spotless? Drape it over a chrome towel ring mounted (with sheet-metal screws) in the luggage compartment.

DISSTON

D-23 Lightweight, Straight-back

HAND SAW

CUTS SMOOTHLY!

CUTS CLEANLY!

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\$895

CUTS FOR A
LIFETIME!

10-to 12-pt. Disstons recommended for smoothest cuts in plywood and other well-seasoned woods

When you're cutting plywood and want a beautifully smooth finished edge, you've got to use a saw that's made for finished work.

That's a 10-, 11-, or 12-point Disston. These fine-toothed saws often make the difference between fine workmanship and an ordinary job. They are specifically designed to be used for finishing.

So if you've been trying to cut plywood or other well-seasoned woods with an 8-point saw, ask at your hardware or tool store for a Disston D-23 in 10-, 11-, or 12-point. You'll get a saw of fine tool steel, with perfectly tempered and double taper ground blade . . . a saw you'll use and treasure for a lifetime.

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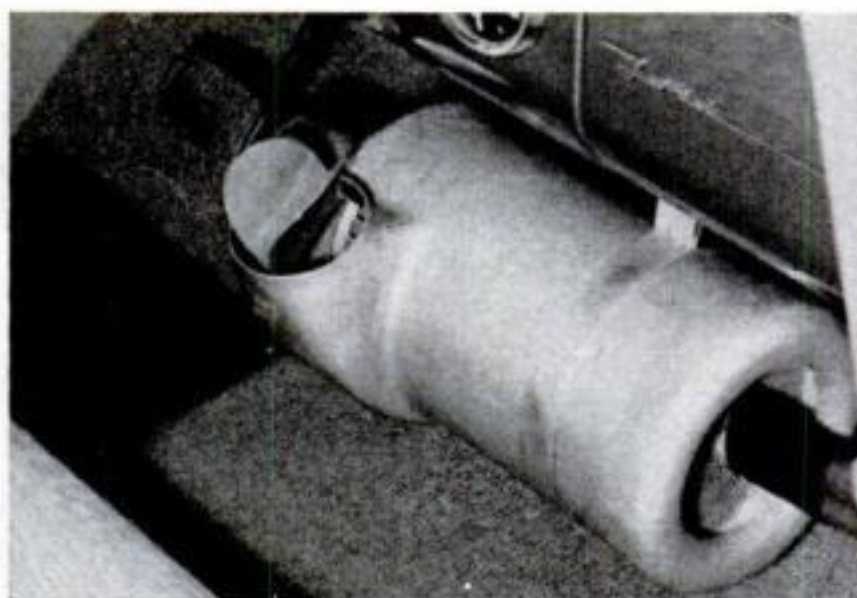
New for Your Car

1. Clear-Plastic Covers Fit Snugly. Made of vinyl and tailored in several sizes to fit various makes, these covers let upholstery of your car show through while protecting it. They require no tacking down; you need only pull them on. They come for split or solid-type seats.

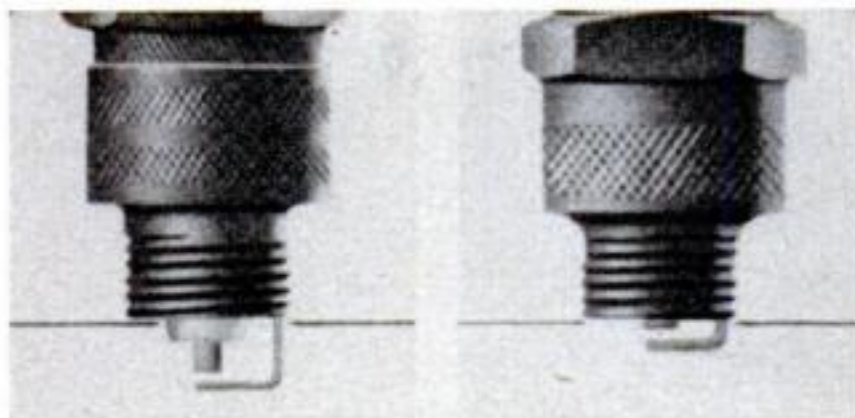
More information about these new car products can be obtained from: 1. Sta-Dri Products Co., 147-47 Sixth Ave., Whitestone 57, N.Y.; 2. Kool Engineering Corp., 3716 W. Belmont Ave., Chicago 18; 3. Electric Auto-Lite Co., Toledo 1, Ohio; 4. California Custom Accessories Manufacturing Co., 301 W. Jefferson, Los Angeles 7.



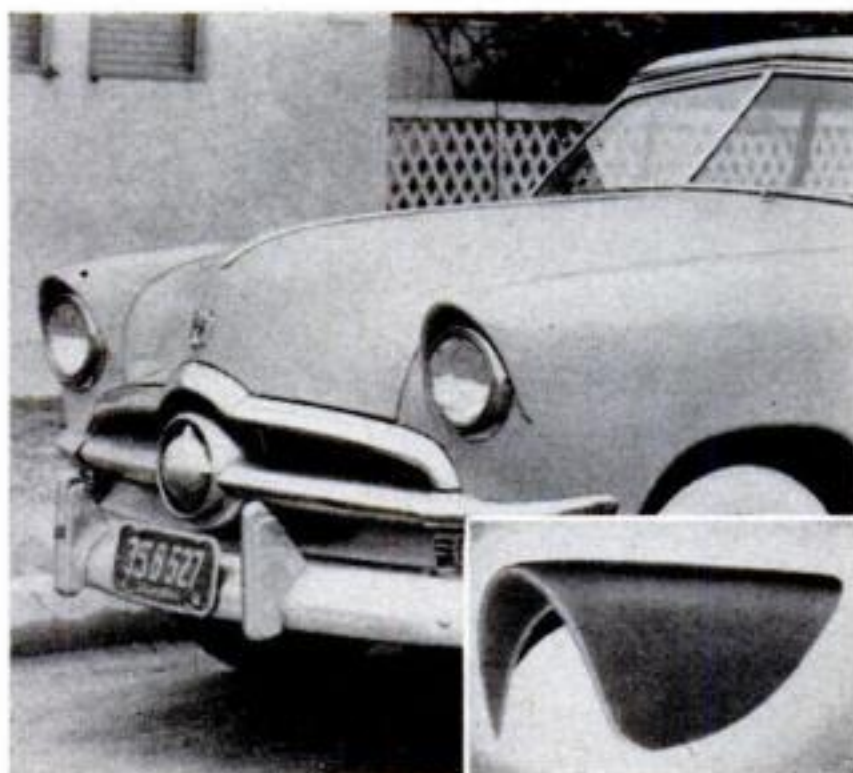
2. Air Conditioner Comes in Kit. You can mount the blower of a new air conditioner under the dash (below) or in the trunk of most 1951 to 1956 cars. The compressor unit goes under the hood. Rubber-hose connections help make it an installation job that you can do yourself. Cool air can be directed by adjusting louvers in the 13½"-long blower.



4. Hoods Modernize Fenders. The hooded headlights of 1956 models can be imitated on many Fords, Chevies and Mercurys dating back to 1949 with the steel extension "eyebrows" in the inset at right. They are welded or brazed to the fenders, and painted to match.



3. Spark Plug Has Long Tip. The long tip of this plug (left) is said to improve burning, putting the spark nearer the center of the fuel mixture than other designs (right). It is for OHV engines.



Glidden Announces . . .

New GLID-TONE products specially made for do-it-yourself wood finishing



Unfinished Furniture

Furniture Refinishing



Interior and Exterior Paneling

Floors



Pleasure Boats

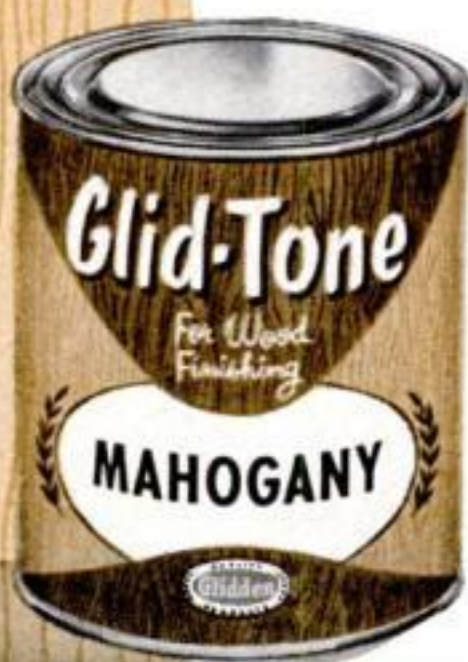
Wood Hobby Products



Antiques



Picnic Tables, Benches, Lawn Furniture



Now Glidden takes the "mystery" out of wood finishing, staining. The new array of Glid-Tone products have "built-in" features for amateur use; give *professional results*. Look for the Glid-Tone label at your paint store.

New, easy-to-use stains in color! Use *Glid-Tone Stains* either inside or out. Seals, does not raise grain. Extremely easy to use—just wipe or brush on, wipe off!

For high gloss and highest resistance to alcohol, acid, heat and abrasion, use all-purpose *Glid-Tone Gloss Varnish . . .* for floors, furniture, table tops, bars, cabinets!

For exterior trim, paneling, boats and marine uses—*Glid-Tone Spar Varnish* is extremely tough, withstands effects of water, salt spray, heat, sun, cold.

For modern, hand-rubbed effects without laborious rubbing, use *Glid-Tone Satin Sheen Varnish*. Self-priming. No thinners or other extras required.

Glid-Strip—a safe, effective paint and varnish remover. Lets you work larger areas because it stays wet longer. Non-flammable. Cleans up with water!

Glid-Tone Natural Wood Filler—for filling open-grained woods . . . oak, chestnut, walnut, mahogany, pine, fir, redwood.

Glid-Tone Crystalac—an all-purpose, crystal-clear brushing lacquer coat for beautifully grained light woods. Dries in only 20 minutes, provides lasting protection. Non-yellowing.



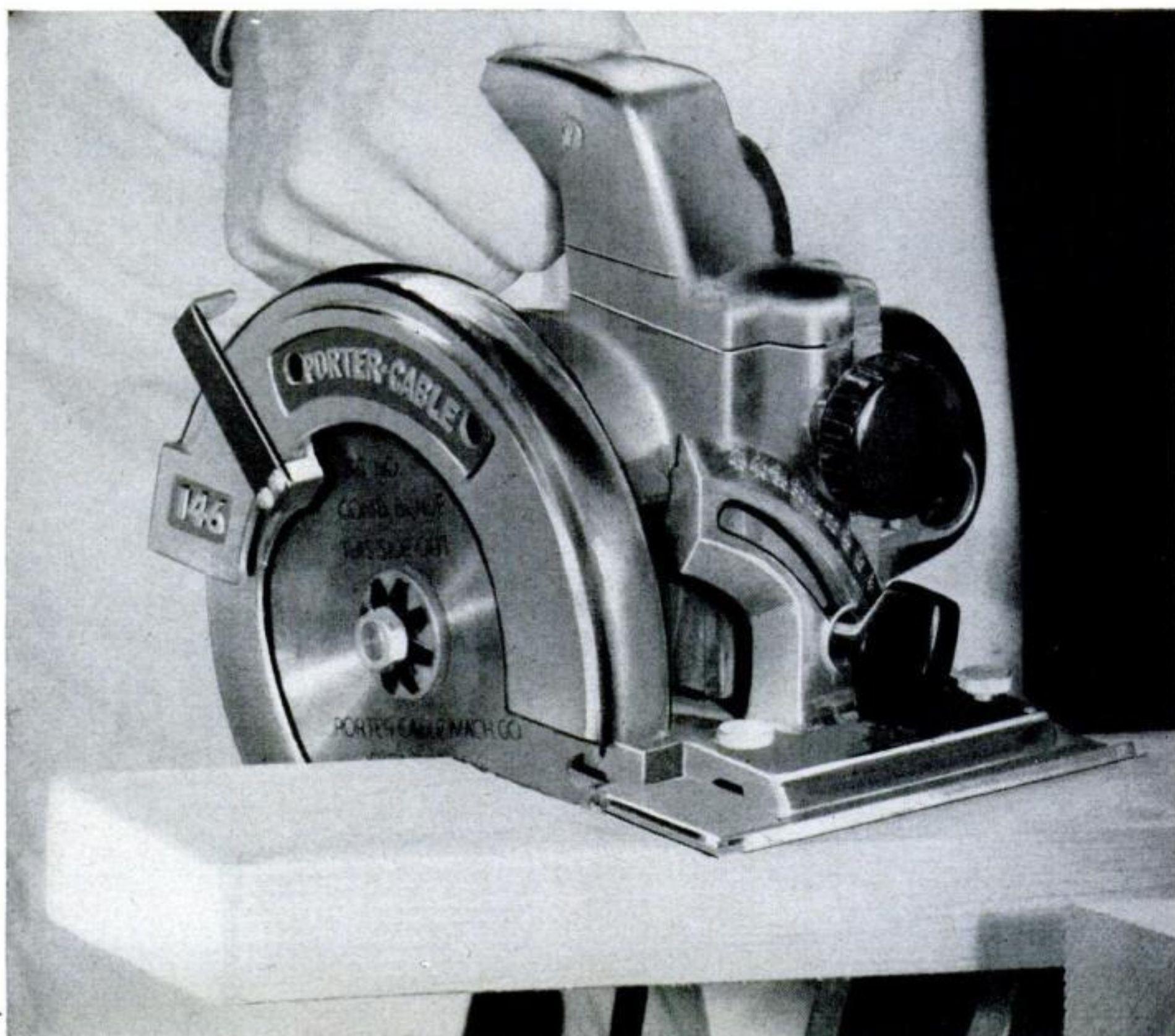
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Tremendous values in these **three great new Porter-Cable saws!**

From Porter-Cable's fifty years of leadership in electric tool design come these three brand new power saws . . . farther ahead than ever in design, in versatility, in solid *value*.

Model 146 is a rugged 6½" saw of full *professional capacity*—makes every cut it takes to build a house. It slices through 2" dressed lumber, even at a 45 degree angle—has a host of special features for convenience and long life. Yet it's priced at only \$69.50—and you'll find a special Introductory Offer on the opposite page that saves you \$12.00 on a complete Model 146 Kit!

If you prefer a saw with blade on the left, be

sure to see Porter-Cable's new Model 157, shown opposite—a big, husky 7¼" professional saw with exclusive Kickproof Clutch, full ball bearing construction, and many other features at only \$89.50.

Finally, there's *the world's finest professional saw*—the all-new 8½" Model 528 Speedmatic. *More speed, more power*—telescoping guard, exclusive Kickproof Clutch, calibrated depth gauge — and every conceivable feature of *quality* design and construction.

See these new professional quality saws at your Porter-Cable dealer's today—or write for full information *now*.



Model 157

Porter-Cable *quality* in a professional 7 $\frac{1}{4}$ " saw with blade on left. Light in weight—only 13 lbs. complete. Ball bearing construction throughout—instant depth and bevel adjustments, telescoping guard, powerful 12 amp. universal motor, exclusive Kickproof Clutch—only \$89.50. In handy kit with accessories, only \$104.50.



Model 528 Speedmatic.

World's finest professional saw. Extra speed and power for extra-heavy duty—perfect balance for easy, all-day use. 8 $\frac{1}{4}$ " blade with new telescoping guard and exclusive Porter-Cable Kickproof Clutch—new calibrated depth gauge, instant bevel adjustment, new handle design with built-in trigger switch. Full ball bearing construction for long, troublefree service. \$130—in kit form with accessories, \$145.

Special Introductory Offer on Model 146. Save \$12.00 when you buy the rugged 6 $\frac{1}{2}$ " Model 146 Saw in handy kit form. Kit includes saw, rip guide, protractor gauge for all straight or angle cut-offs, and a strong steel carrying case. Regularly \$87.75—now only \$75.75! Offer expires July 30, 1956—See your Porter-Cable dealer *now!*

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In Canada: write Porter-Cable, Ltd., Box 5019, London, Ont. Canadian prices slightly higher.

JUNE 1956 **213**

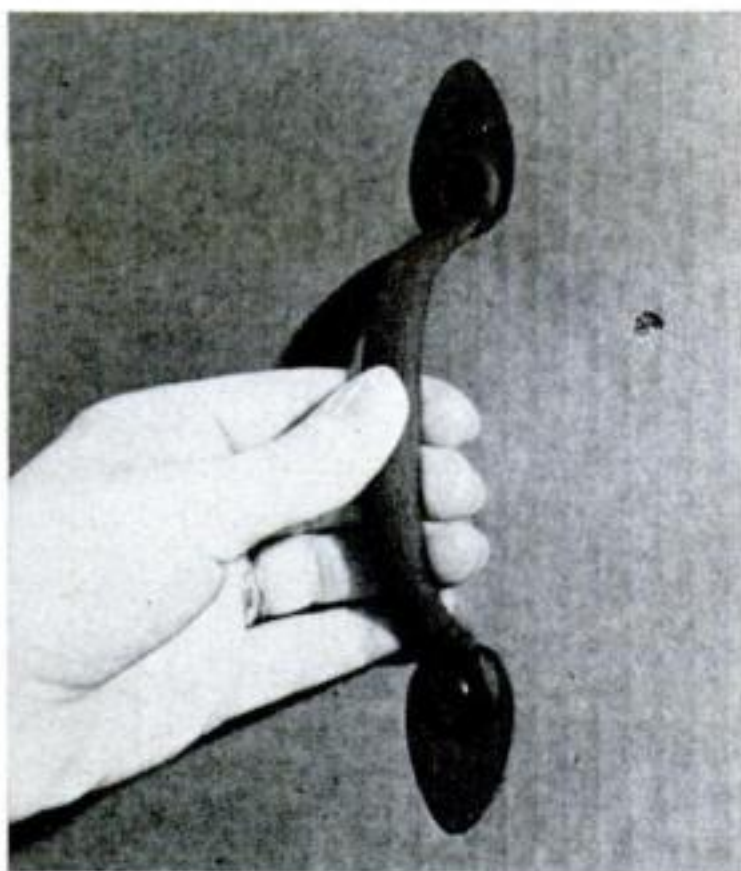
Three Sailors Put Their Hi-Fi Amplifiers on Bread Pans



SEEKING inexpensive chassis on which to mount hi-fi amplifiers, these three sailors cooked up the novel idea of using baking pans. They found that 90-cent bread tins worked out fine for their basic power-amplifier units.

The trio, left to right, Radiomen Nicholas Milano, Willis B. Rush and Bobby J. Brittain, are stationed on a naval air base in Hawaii.

DO IT THE EASY WAY



HANDWROUGHT HARDWARE can be simulated by painting plain pulls black and putting them over shaped hardboard.

STICKING STEEL DRAWERS can be freed by rubbing sliding parts with pencil point.



TO SIPHON GAS without getting any in your mouth, use an ear syringe to start. Squeeze syringe, insert in tube, release.

PAINT A CHAIN in a paint can for a fast job without cleanup. Suspend the chain from a rubber band and dip it in paint.



Carburetor Service is a Science...

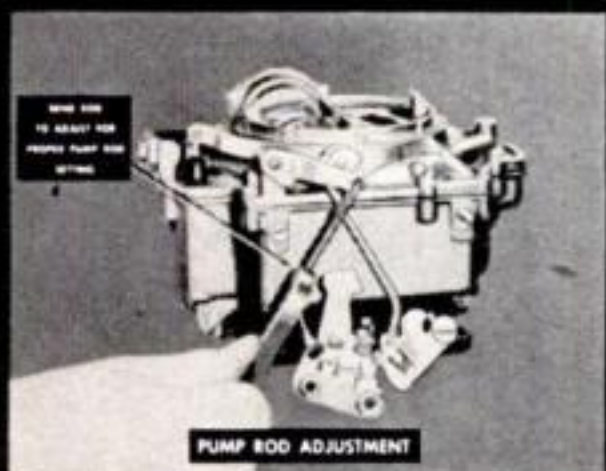
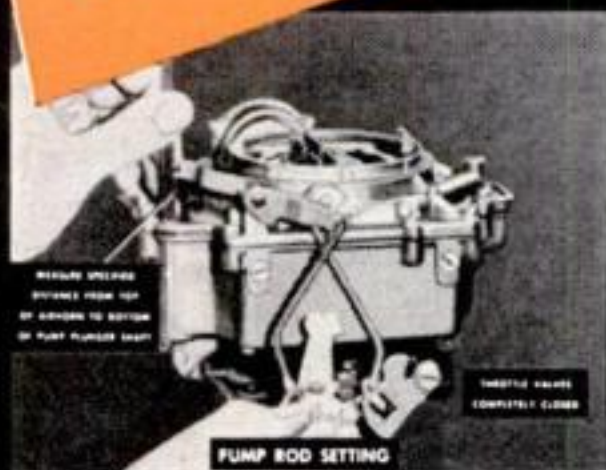
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You can't stump the experts on carburetion service. But *you* are the expert when you finish the complete course now being offered at GM Training Centers throughout the country. Factory-trained technicians, using up-to-date methods and materials, teach you the fundamentals of today's highly specialized carburetor design... the fine points of service that make you master of Rochester Carburetor jobs. Take advantage of this opportunity to *learn more... and earn more!* Write the United Motors Service distributor in your area for further information, *today!*

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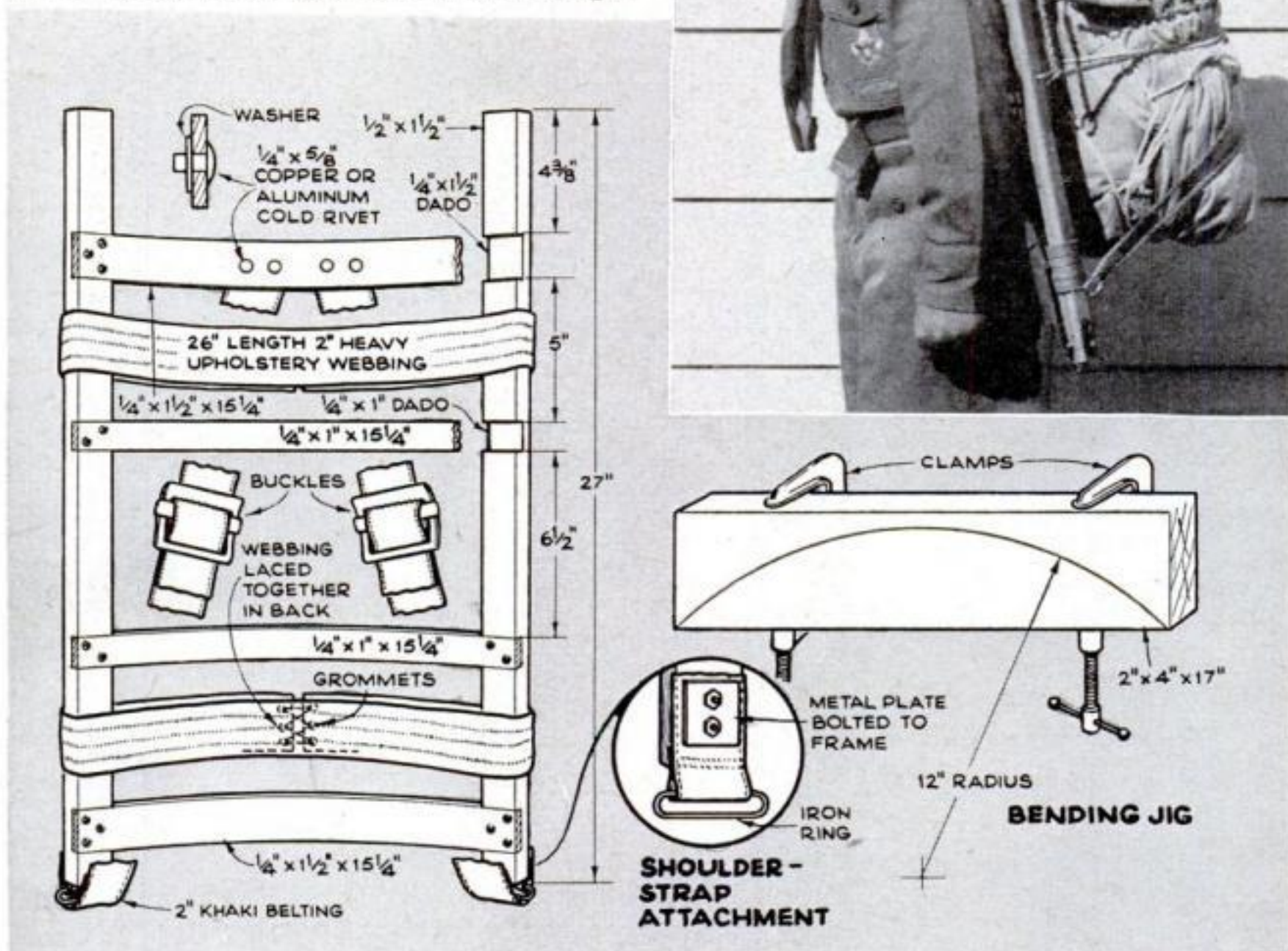


**CARBURETORS BY ROCHESTER
PRODUCTS**

Pack Frame Eases Camp-Gear Load on Junior's Back

ANY young hiker will enjoy toting his pack on this sturdy frame made of oak or birch. You can bend the crosspieces in jigs like that shown. Soften the wood first by boiling it in water. If big clamps are not available, tighten the jigs in a vise and nail cleats near the ends. Let the pieces dry in the jigs for about a week; then assemble with screws.

Sand and shellac the frame, attach screw eyes, webbing and shoulder straps.



Circle Stamp Made from Hose

A STAMPED circle will highlight a printed section that you want to get some special attention.

The stamp is a piece of rubber hose cemented to the end of a short length of dowel. Let a fraction of an inch of hose project. Anchor with a screw or pin.



Putty Ring Protects Can Lip

PAINT, glue and similar materials will harden in the groove in the lip of a can and prevent a tight seal. You can avoid this annoyance by stuffing a ring of putty in the groove before pouring. Lift the putty out to replace the lid.



Put up ceiling tile with a Bostitch T5-8 Tacker with Bostitch 9/16" or 1/2" staples. Press nose of tacker firmly into cove formed by tile flange. Squeeze the lever. You can drive three staples 4" apart in about three seconds and go on to next tile. You never mar the face of the tiles, and you can wear gloves to keep them clean.



Apply insulation with either the Bostitch T5-8 Tacker or H2B Hammer, with Bostitch 3/8" staples. The hammer is faster with a little practice. You can drive staples with a flick of your wrist—*much* faster than hammer and nails. One hand is free to position the insulation. Ask your building supply dealer or Bostitch representative.

Best way to install ceiling tile and insulation

In co-operation with leading makers of ceiling tile and insulation, Bostitch has prepared a booklet which gives detailed instructions for installing

Armstrong Cork Company	makers of Temlok® Tile, Temlok® Plank and Cushiontone®.
The Celotex Corporation	makers of Celotex Tile Board and Finish Plank and Celotex Regular and Reflective Rock Wool Blankets.
Infra Insulation, Inc.	makers of Infra Multiple Aluminum Thermal Insulation.
Minnesota & Ontario Paper Company	makers of Insulite Tile Board, Plank, and Interior Board.

these materials. The following firms have contributed information for this booklet and approve this method of installation.

National Gypsum Company	makers of Gold Bond Insulation Board Products and Rock Wool Insulation.
Reynolds Metals Company	makers of Reynolds Reflective Aluminum Insulation.
United States Gypsum Company	makers of Twin-Tile, Panel-Tile, Quietone, Auditone, USG Insulation Plank, and Red Top Insulating Wool.
American Sisalkraft Corporation	makers of Sisalkraft and Sisalation.
Wood Conversion Company	makers of Balsam-Wool and Nu-Wood Ceiling Tile.

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Please send me a free copy of your booklet on how to install ceiling tile and insulation.

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Tiny Rooms Show U.S. History

[Continued from page 98]

dolls. She loved to make little rooms look real and livable.

So friends and relatives often gave Narcissa doll furniture and other tiny objects. But the furniture she got seldom matched the sizes of the rooms in her dollhouses. Resourceful and adept with her hands, she rebuilt the furniture to fit.

Her uncle was Rear Admiral Albert Niblack. From the far corners of the globe he brought her tiny china tea sets, little copper vases and urns, bits of decorative jade and porcelain, and other similar miniatures. Later, when Narcissa married the son of one of the founders of Montgomery Ward and became Mrs. James Ward Thorne, she too had the opportunity to travel extensively in Europe and the Middle East. On every trip she gathered together more tiny objects for her collection—which grew so large that she decided to construct miniature period backgrounds as artistic showcases.

At first she did the work herself, using jeweler's tools and dental instruments. Later, as the project grew, she employed a few skilled craftsmen to help her. To gather accurate information for her rooms she made trips both here and abroad, visiting historic houses and typical homes. Many of the miniature rooms and their furnishings are detailed copies of actual rooms that she saw.

For a dozen years, the miniature-room collection was shipped around the country as a circulating exhibit at world's fairs and museums. Finally, Mrs. Thorne presented the collection of rooms, with money for a fireproof, air-conditioned gallery, to The Art Institute of Chicago, where they are on permanent exhibit.

There are 37 rooms depicting American homes through the decades, and 30 reproductions of European rooms. Each is approximately 18 inches high, three feet wide, two feet deep. Nothing in any of the rooms varies more than 1/32 of an inch from the scale of one inch to a foot.

Although some of the tiny objects in the rooms are a part of Mrs. Thorne's collection of miniature objects, many of

the furnishings had to be made. It was quite an accomplishment: Some of the rooms contain more than 100 tiny pieces of furnishing. One room contains 134.

To hold to the strict scale, rugs were handwoven, lighting fixtures and chandeliers were handcrafted by a New York jeweler, upholstery materials were specially made, wallpapers were made with small designs, even newspapers were printed up in microscopic type. Some of the miniature items took the skilled craftsmen as long as six weeks to create.

Realism is carried to the nth degree. The wood flooring in the rooms is not just a rectangle of wood scored to look like floorboards. It is made up of actual miniature boards, hand-cut to fit. In many of the early American rooms, the tiny boards are actually pegged down with pinlike wooden pegs. Doors aren't just prop doors painted on the walls, they are real doors that open and close. Even the windows work. In one American room a tiny ship-in-a-bottle model rests on the fireplace mantel. The bottle measures less than an inch in length!

Tiny pots and pans hang close by kitchen fireplaces. Miniature spectacles, and even half-finished pieces of knitting, complete with needles, rest on tables. Midget leather-bound books with actual pages fill the bookcases. Tea pots and dishes are set out ready for use.

To make the illusion even more complete, open doors allow you to look into the corners of other rooms and hallways beyond. In some cases, front doors are open to give you a view of a flowering garden, a picket fence, or a rural scene.

Although no accurate account of the actual cost of building and furnishing the rooms was kept, their value is estimated at more than a million dollars. That averages about \$15,000 a room. **END**

Bull's-Eye

A scientific type we know summed up the missile problem this way—"The Air Force should put less effort into 'missiles' and more into 'hittiles.'"—*Air Force Magazine*.



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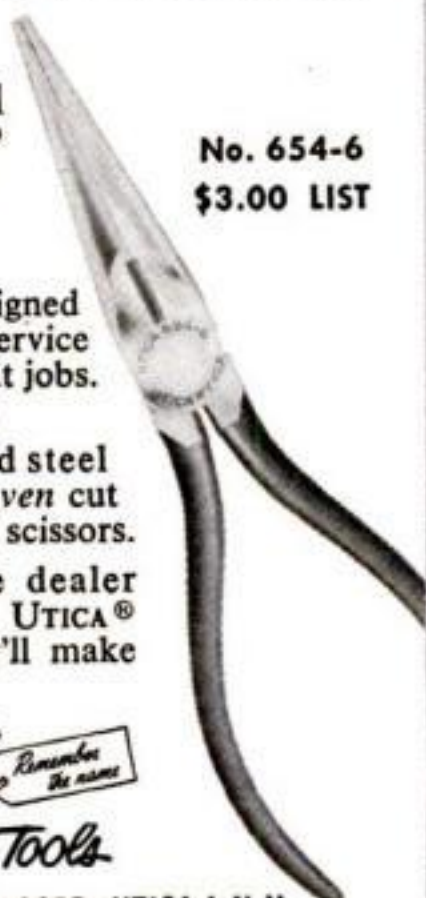
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membership moved out to watch Fred Pettigrew install a set of points.

GUS did not stay for the demonstration. He returned to the Model Garage, put on his work clothes and continued about his business.

Pretty soon Jack Bishop pulled in. His face was red. He was waving a copy of Philo Dittington's book.

"It's just as you said, Gus. This is a collection of nothing. The only chapter that tells anything at all is the one on installing points. The rest is just a lot of stuff about the Dittington principles."

"Good thing I didn't buy a copy," Gus said. "I'd be out a buck, too."

"But, Gus, you guaranteed them! You said they could get their money back at the Model Garage. What are you going to do?"

"Sit tight."

Jack exploded. "You should have seen the guy. While Fred was installing the points—and I suppose it was impressive to see him read the directions like a cook book and then do what it said and have it come out right—while Fred was working, the little Dittington guy moved around selling his book. I never saw anything so smooth. And what a line of chatter. Of course a big crowd gathered. He must have sold a hundred books. And plenty of those bottles of pills at two bucks apiece. When Fred had finished and he'd sold his last book, he stepped on the starter and the engine started as smooth as could be. Then he was off. That's when us suckers began looking at our merchandise."

Gus pointed down the road that came from the center of town. The first two or three of what soon developed into an avalanche of unhappy customers were bearing down upon the Model Garage. When the dust had cleared, Gus climbed up on an oil drum.

"Gentlemen and members of the fraternity of Do-It-Yourself," he began. The faces turned toward him were friendly because everybody in town trusted Gus.

"How are you going to get out of this pickle?" someone shouted. Gus joined in the laughter.

"You want your money back?"

"You bet we do! You said you'd give it to us!"

GUS held up his hand. "No, I didn't," he corrected. "I said you could get your money back at the Model Garage."

"What's the difference?"

"The difference is this: You'll get your money back at the Model Garage, but Dittington will give it to you. Mr. Do-It-Yourself is a fake—and he'll prove-it-himself."

"How do you know? We'll never see him again."

"I think you will," Gus assured them. "I figure it this way. When he left you, he did what any one of you would have done under the circumstances. He went around the corner to count his money. According to the crowd gathered here, that could take a long time." The crowd laughed. "About five minutes ago, he started his car once more, listened appreciatively to the sound of Fred's skillful work. In about two minutes or so, he will come chugging and spitting up the highway, and unless I miss my guess, will stall completely somewhere around the Model Garage."

Exclamations of disbelief greeted this last statement, but just then Jack Bishop called out: "Look what's coming!"

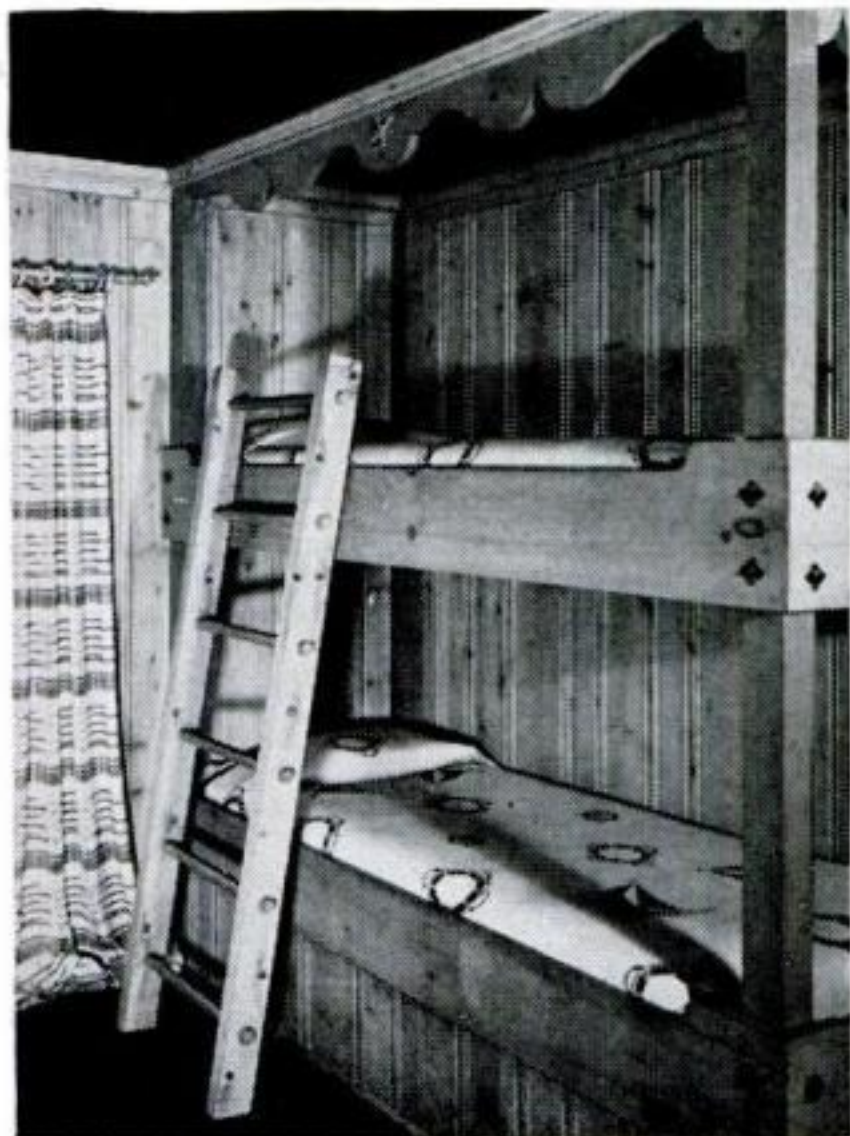
COUGHING and sputtering, the car containing Mr. Do-It-Yourself lurched along the street. With a final wheeze it stopped out front.

"Get your money back at the Model Garage!" shouted Gus. The crowd turned as one and swarmed over Dittington. They soon had their dollars back and were looking to Gus for an explanation.

Gus spoke severely to Mr. Dittington. "Mister, you got just what you deserved. You're out to cheat the public. Most especially, you discourage people who

[Continued on page 222]

Space-saving bunks are easy to build— economical, too!



You'll enjoy making these sturdy bunk beds of clean-cutting, even-grained Western Pine* woods. They'll take years of hard wear and keep their good looks indefinitely, thanks to the handsome natural texture and grain of these mellow woods.

Easy workability and amazingly low cost are *plus* values you get when you use carefully selected, well-seasoned Western Pines. See them at your local lumber dealer's and get an estimate.

FREE "INSTALLING AND COLORING YOUR WALLS OF WESTERN PINES." Also, "FRIENDLY HOME IDEAS IN WESTERN PINE," new 88-photo booklet of building and remodeling ideas. Write for both to Western Pine Association, Dept. 500-L, Yeon Building, Portland 4, Oregon.



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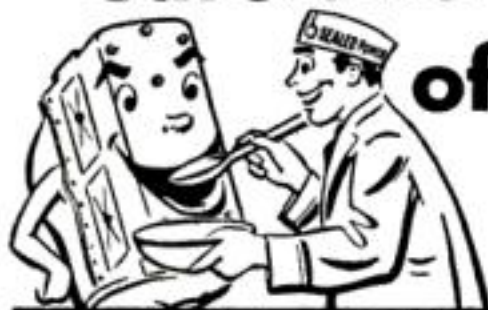


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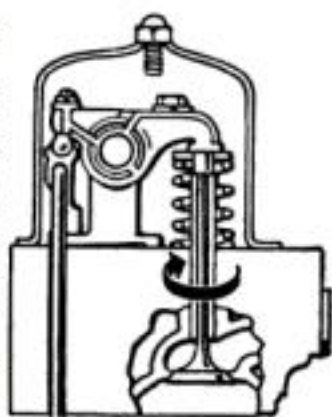
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S. P. CORP

VALVE TAPPET ROTATION

Valve tappets should rotate on the cam lobes. This rotation is caused by a small degree of rake on the surface of the cam lobe of the camshaft, coming in contact with a convex surface on the tappet foot and moving it part of a turn each time the tappet is lifted. This insures long life for tappets.

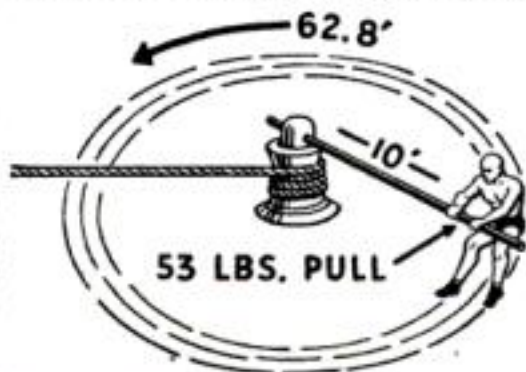
This rotation should be verified whenever valves are inspected. Failure to rotate means tappet may be dry in the guide, or a flat spot may be worn in the foot of the tappet. Check rotation when installing a new tappet or a new camshaft. If either tappet or cam lobe is worn, tappet may not rotate, causing wear and noise.

In L-head engines, tappet rotation promotes valve rotation, insuring a tight seal. In OHV engines it is important that valves rotate each time they open or close, to keep valve seat clean and minimize wear. If valves are not turning, look for a sticking condition in valve guides and check for correct valve adjustment. Lubricate valves around guides with penetrating oil.



TORQUE AND HORSEPOWER

Torque is twisting effort. If a man applied 53 pounds of torque on a 10-foot lever, moving over a 62.8-foot circumference in one minute, he would perform one-tenth of a horsepower of work. If he increased his speed to make two revolutions a minute, he would exert twice as much horsepower, but the 53 pounds of torque would remain the same. When an engine has 218 foot-pounds of torque at 2000 R.P.M., that is simply a statement of pull at the end of shaft (or lever).



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Sealed Power

PISTON RINGS

Gus Bait's a Trap

[Continued from page 220]

would like to do things themselves. It takes more than a book of directions—especially yours. Now, do you want me to fix your car, or don't you?"

Dittington cleared his throat. "How much?" he croaked.

"Not a cent. But while I'm working, you stay in your car. This lesson in Do-It-Yourself is for these gentlemen only." He lifted the hood of Dittington's car and removed the breaker arm from the distributor. He took it to the back of his shop, out of hearing of the deflated little promoter.

"**N**ORMALLY this sort of thing doesn't happen," Gus explained. "But this particular year on this car always gave trouble. Usually the breaker arm fits easily over the pin—not too loose, not too snug. But on this car, a new set of points always has a tendency to be too tight. Being too tight, the friction of its movement on the pin causes heat. The heat causes it to bind. It almost always happens *just about a half-mile away*, if you put in new points as you got them. I'll take this reamer and make this hole a little bigger. Now it will run free."

"What I don't understand," said Jack Bishop, "is why this never happened to Dittington before."

"He just bought this car a short while ago," Gus explained. "Hadn't had this make before. The ones he'd had didn't have this trouble. Now let's speed the little faker on his way."

In a jiffy the job was done, the hood lowered and engine purring. Philo Dittington leaned out the window.

"Sir," he said, his weak eyes moist, "I owe you a debt of gratitude."

As he drove out of sight, Stan Hicks, Gus's helper, murmured, "Boy that was close, Gus. Suppose that car had gone more or less than a half-mile? Or that he had taken a different road out of town?"

Gus smiled. "That's easy. We would have gone into the book business." **END**

NEXT MONTH: Gus follows a false trail.

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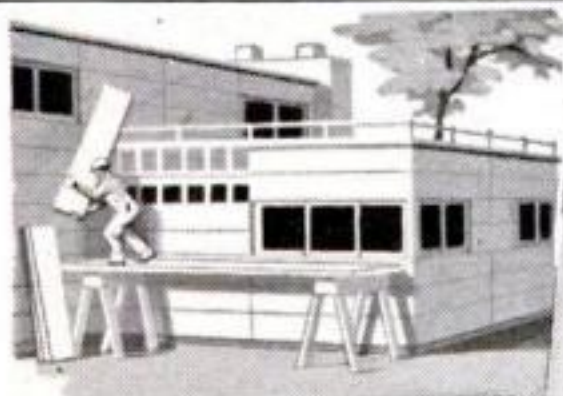
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Can We Steer Hurricanes Away?

[Continued from page 88]

that you inject into the cloud," says Dr. Langmuir. "You can see the infection spread."

The dry ice starts a chain reaction that releases a great deal of energy from the cloud. In a hurricane, this release of energy might shift the storm center to one side of the powerful air currents which give the storm its general direction. That would change the path of the hurricane—not much, but a little. A very small change could be terribly important.

Will it work? Dr. Langmuir says, "I think the chances are excellent that with increased knowledge something can be done. Right now we are in the position of a surgeon who has a knife but does not know yet where to cut."

A somewhat less hopeful attitude is taken by the official Advisory Committee on Weather Control, which includes some of the country's leading meteorologists. The Committee states:

"These experiments will prove interesting and probably of value but if means are devised to prevent or significantly modify hurricanes this will probably be something for the far future."

(The Advisory Committee is, however, more sanguine about other uses of cloud-seeding. It concludes that rainfall is definitely increased by seeding, and that the prevention of hailstorms is a "hopeful prospect.")

The Weather Bureau's Simpson, who will direct the actual hurricane-seeding tests this summer, is cautiously optimistic. He says:

"The possibilities, such as they are, for changing the path of a hurricane depend on techniques for taking the storm by the hand and leading it gently to one side—probably no more than a few tens of miles. Yet this often would be enough to make the difference between disaster and relatively minor damage.

"There is no reason to believe that we cannot find out how to make hurricanes behave." **END**

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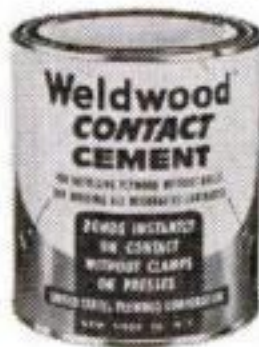
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Keeping You Out of That Traffic Jam

[Continued from page 116]

I cut you off the last time. Here's a green light for you now."

This type of signal is replacing the fixed-time signal in many communities. The fixed-time signal rigidly allots a given number of seconds to each street, regardless of whether one or a dozen cars are waiting.

Combine a lot of traffic-responsive signals, under a master control, along a main street, and you have a sophisticated arterial system. Install them on main streets and cross streets, again under a master control, in a big area, and you have a "grid" system with a college diploma.

Such coordinated signal systems, as they are called, have been put in service in the last couple of years in—among other cities—Houston, Baltimore, Atlanta, Fort Wayne, Winston-Salem, Los Angeles, Vallejo (Calif.), New Orleans, San Diego, Mobile and Chattanooga.

The most extensive, and perhaps most complex, "thinking" traffic-control system recently was put into operation on Philadelphia's famous Broad Street, a madhouse of congestion at the morning and evening rush hours.

Single intersections report the number of cars on Broad Street and cross streets to a "brain." The "brain" collects the information and evolves a pattern of green-and-red timing for *all* the signals in its area. Moreover, it takes care that the *progression* of signals will not be upset. This gives a Broad Street motorist a succession of green lights at a particular speed.

Four master controls, in charge of four sections, boss Broad Street's traffic. In addition, there are three "floating" traffic light intersections where cross traffic is particularly dense. They are not dovetailed into the sub-systems.

The immediate gimmick in the car-counting circuit is a pressure pad sunk into the pavement. Pressure pads are installed all along Broad, as well as in each side street. When a car depresses a pad

[Continued on page 228]

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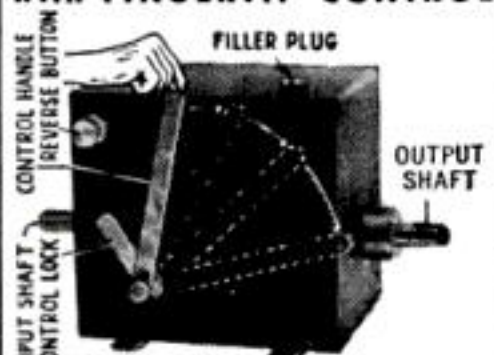


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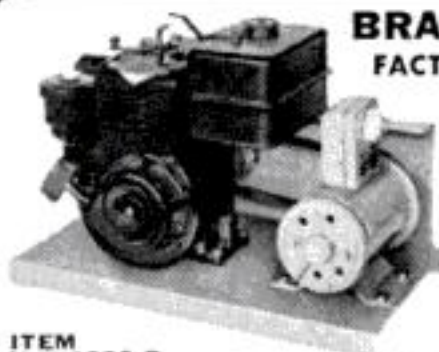
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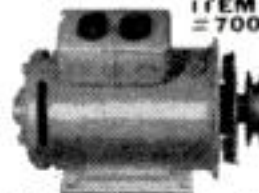
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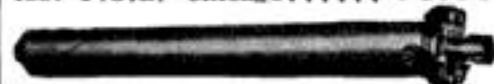
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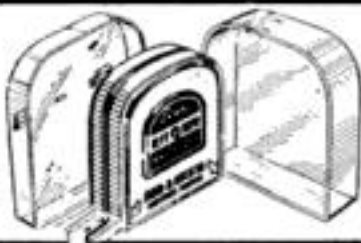


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THE TURNER BRASS WORKS
SYCAMORE, ILLINOIS

Keeping You Out of That Traffic Jam

[Continued from page 226]

in a side street, an intersection light controller—the "straw boss" of the system—takes note.

Two factors govern the length of time the car will wait for the light. One is the volume of Broad Street traffic. A count of this is maintained at each sub-system headquarters on the basis of reports by the Broad Street pads. The other factor is the "offset" of the Broad Street lights—the progression-timing at which they are turning green.

How long the side street gets the light depends on Broad Street traffic and how many cars have crossed the pad in the side street.

Helping, too, during rush hours on Broad Street is a system of "unbalanced flows"—an extra lane in the direction of densest travel.

Pedestrians are not forgotten. Push buttons at intersections along Broad Street enable them to get a light. They have 15½ seconds to cross.

Almost everywhere that traffic-actuated controls are in operation, traffic is moving at a faster clip. Houston and Los Angeles make especially strong affirmation that traffic jams can be unjammed. With one-way streets, traffic-actuated signals, wide expressways without intersections and unbalanced flows, traffic is being moved faster all the time.

Los Angeles, in particular, has amazed the experts. The goal of the traffic engineers is to move 1,800 cars an hour per lane past any given point. Most towns move a quarter to a half of that. But Los Angeles is moving up to 2,100 vehicles per lane at the rush hours on its freeway (expressway) system.

Constantly experimenting, the traffic engineers find that the jam problem frequently is cumulative. They installed traffic-responsive lights for 11 miles along Ventura Boulevard in Southern California's San Fernando Valley.

The lights worked fine, but Ventura Boulevard fed so much traffic into the Hollywood Freeway that traffic jams began developing there.

END

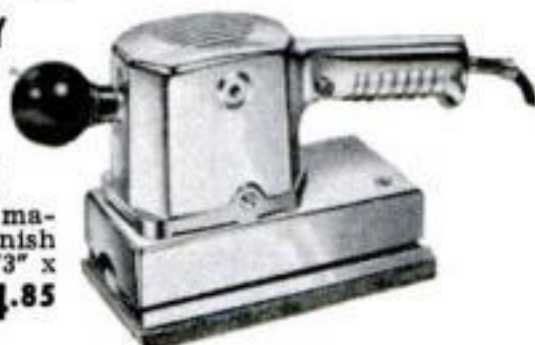
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THE LUFKIN RULE COMPANY, DEPT. PS, SAGINAW, MICH.
Please send your free "New Tools" catalog to:

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STREET _____

CITY _____ STATE _____

NEW CHILDERS DO-IT-YOURSELF CARPORT

Patent Pending



The modern way to protect your car and beautify your home

"We installed ours in four hours . . . saved \$95,"

says Mr. Joseph Saladino, Houston, Texas.



The Saladinos' problem was more living space. So—they installed a new Childers Do-It-Yourself Carport for the family car, and converted their garage into a third bedroom. **You save twice with the new Childers Carport.** First, you deal directly with your local Childers factory outlet. Second, it's so simple and easy to erect the Childers Carport yourself. You can erect it in one afternoon! The new Childers Carport is America's most modern design. Architecturally approved, its beautiful, trim lines harmonize with any style home. It increases the value of your property. Precision-made from zinc-plated steel, it will last as long as your home.

New, modern car protection • Save up to \$95 • Erect in one afternoon • Full size, 20' x 10' • Pay nothing down • Only \$1.93 a week • Free standing or attached



CHILDERS ALUMINUM AWNINGS GUARANTEED TO SAVE YOU 30%



Berkley



Windsor



Casement Awning



Door Canopy

We guarantee your cost of Childers Aluminum Awnings will be at least 30% less than your neighbor paid last year for his old fashioned, custom-made awnings. You save 30% or more because:

1. You get factory prices from your direct factory outlet.
2. You install Childers Aluminum Awnings yourself with just screw driver and pliers. Saves installation charges.
3. Childers Awnings are mass produced in the world's largest aluminum awning factory. Costly hand assembly is eliminated.

Your local Childers factory outlet can supply the correct size Childers Awning to fit any window, door or porch—at direct factory prices.

FREE IDEA FOLDER

Childers Manufacturing Co., Dept. PS-6
Houston 8, Texas

Send me free literature on the Childers guaranteed products checked below; also name of my local Childers factory outlet.

Childers Carport ☐ Childers Aluminum Awnings ☐
Childers Patio Cover ☐

Name _____

Address _____

City _____ Zone _____ State _____

CHILDERS
GUARANTEED
Products

Lumberyard Known 'Round the World

[Continued from page 133]

random customers just out of politeness.

It suddenly occurred to Albert Jr., that if he could scare up enough small purchasers the business might be revived. He invested \$5 in an ad in a home workshop magazine. With another small ad in POPULAR SCIENCE MONTHLY, Constantine's home craftsman business was started on its way.

Strictly a family affair, the firm now includes, besides Mr. Constantine, a daughter who works in the office, and her husband, John Docherty, who is in charge of the mail-order department. Mrs. Constantine is the company's chief buyer. In Mr. Constantine's office are the first and second desks ever owned by the

.....

You've got to admire the fellow who hits the nail squarely on the head for keeping his eye on his thumb.

—THE SIDEWALK SUPERINTENDENT

.....

company—now valuable antiques—and an oil portrait of John Constantine, the firm's founder, in his uniform as a lieutenant in the War of 1812.

Besides the Constantine family there are about a dozen other employees during slack periods and 20 to 25 during the rush winter season. To help reduce the summer slump, when good weather keeps home craftsmen out of doors, the company has recently begun selling boat lumber and marine supplies.

The salesmen are craftsmen who speak the language of the experienced wood shopper. Mr. C has two workshops—one in his winter home on City Island, New York, and the other in his cabin in the mountains. John Docherty has taken courses in woodworking and power tools and made a lot of his own furniture. On Saturdays the company sponsors lectures at nine a.m. with repeat classes at two p.m. The most popular, which takes five weeks, is on wood finishing; others cover such subjects as power tools, wood joinery, plastic carving, veneering, making inlaid pictures and upholstering. **END**

Rugged, ball bearing WINCH

Sturdy ball bearing winch—super tough aluminum alloy construction. Powered by an easy starting 2 3/4 HP Briggs gas engine thru gear reduction drive—it exerts up to 3000 lbs. of terrific force for hoisting materials or pulling. Combination gear and pulley reduction results in tremendous multiplication of engine power. Idler pulley clutch arrangement and built-in drum brake (with ratchet hand lever) enables operator to ease loads down gently and lock at any point desired. Drum handles 400 ft. of 3/8" cable or 600 ft. of 1/4" cable. Ideal for contractors, farm implement trailers and unlimited other uses! (Item 795) Wt. 125 lbs. Only **\$149.50**



EXTENSION CORD

Heavy duty and very flexible. Neoprene 14-2 cable. 20 year quality. Wt. 12 lbs. (Item 185) 100 ft. Complete with rubber plug and outlet. A terrific buy at only **\$8.95**



No. 10-2 POWER CABLE. Heavy duty, very flexible, rubber covered, 50 ft. with male and female fittings. Wt. 9 lbs. (Item 592a) **\$10.45**
No. 12-2 POWER CABLE. Very flexible rubber covered, special outside shield for grounding power tools, etc. 50 ft. (Item 199) Wt. 8 lbs. **\$6.95**. 100 ft. (Item 200) **\$12.95**

HI-FLO Centrifugal PUMP



Completely self-priming! No foot valve required. Tremendous capacity—100 gal. per min. 1... Special impeller enables pump to handle muddy or sandy water. Simple to operate—simply start engine and watch the water go. Powered by a rugged, easy-starting 2 HP Briggs engine. Pre-lubricated sealed bearings for years of heavy low-cost service. Big 1 1/2" Model. Item 502. Wt. 70 lbs. **\$134.50**

2" Model (150 gal. per min.) with 2 1/2 HP engine. Item 502a. 90 lbs. Fact. Spec. **\$154.50**

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bedrock factory prices



600-700 WATTS PUSH BUTTON START

115 v. 60 cyc. AC Powered by a rugged 2 HP easy starting Briggs engine. No wiring necessary; just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc., which require

up to 700 watts. Ideal for television and radios. Complete with Voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24.) Wt. 75 lbs. Easily fits in car trunk. Be prepared if storm knocks out power lines. Reg. \$275 value. **\$143.50**
1000-1200 Watt Plant (Item 45) same as Item 24 but larger generator and engine with 50% greater output. **\$199.50**

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Write, giving us your requirements!

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Now, a super efficient portable steam generator that produces live steam at 100 lbs. pressure in 60 seconds from a cold start! Produces large volume of high pressure steam on 2 pints of fuel oil. Instantly cleans sticky grease, dirt, rust, old paint, etc. off implements and road machinery. Pays for itself in a few weeks. Sterilizes soil. Sterilizes as it cleans—milk equipment, etc. Fully automatic—oil fired with new, built-in lifetime bronze water circulating pump. Draws water from faucet or bucket. Simple and safe—anyone can use it; built-in safety valve. Complete with 12 ft. of hi-pressure steam hose and new triple efficiency steam gun that automatically mixes in soap solution if desired. Wt. 250 lbs. Item 463. **\$329.50**
 Special factory price.....



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Genuine Neoprene Hose—outlasts ordinary rubber 3 to 1. Reinforced with super tough cotton cord plies—yet completely flexible. Equipped with standard thread male and female fittings. Pump water for irrigation, stock tanks, home, barn, fire fighting, etc.—or pump gas and fuel oil. Volume factory prices—save more than 60%.



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1 1/4"	25 ft.	13.95
1 1/4"	50 ft.	24.75
1 1/4"	100 ft.	49.95
1 1/2"	10 ft.	10.95
1 1/2"	25 ft.	14.75
2"	10 ft.	16.50
2" (no cord plies)	10 ft.	9.50
2" (suction)	14 ft.	21.50
2 1/2" (discharge)	10 ft.	21.75
3"	10 ft.	25.50

1 1/2" I.D. HIGH PRESSURE STEAM HOSE per ft. \$1.00

AIR HOSE Heavy duty, 1/4" I. D., 2 plies (150 lb. pressure) with standard couplings, 20 ft. lengths, ea. **\$2.95**
PAINT SPRAY MATERIAL HOSE 3/4" I. D. Synthetic Thikol inner tube and neoprene cover—finest model 25 ft. lengths with standard couplings. (Item 62) **\$7.50**



HEAVY DUTY D-C ARC WELDER

Use as portable or shop welder. Up to 300 amps. Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Easily welds up to 3/4" plate using 1/4" rods. Built-in air cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2600 rpm. with tractor, jeep or 15 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, guar. and triple V belt or flat pulley. Easy to hook up and easy to operate. Wt. 110 lbs. \$400 value. **\$119.50**

WELDING KIT two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at... **\$10.50**

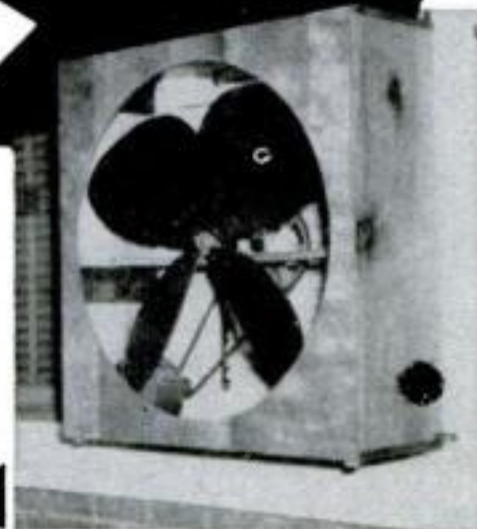
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Daredevils Challenge Ghost Ship

[Continued from page 110]

tows—after that he just quit counting.

Below Vicksburg, his two Mark 40 Mercury motors were purring like contented cats when he suddenly found the river aflood with driftwood. A logging camp on the Yazoo had chosen this time to discharge a sea of refuse into the Mississippi. Before he could say "Koenig Cup," Sawyer's boat was dead in the water, surrounded by logs and a floating mat of tangled wild grapevine.

Wearing his life protector—standard equipment for Mississippi racing pilots—Sawyer jumped into the water with a hacksaw. One by one, he sawed through the grapevine tendrils that had wound around the props, replaced a sheared pin, and got under way.

Later he lost 3½ hours with engine trouble. As he neared St. Louis, he ran afoul of a fisherman's trotline. It took him two hours to clear his props, but he still managed to beat the record and hold the Koenig Cup for a year.

River racing is not cheap. Sawyer's boat, a 15-foot hull of molded plywood with fiber-glass covering, which he calls the *Huckleberry Finn*, was specially made—the reinforcing has to be heavier than in an ordinary boat—and cost \$800. His twin motors cost \$1,300. He paid \$500 to five friends who followed him upriver in a station wagon and a truck, contacting him at eight refueling points. By the time he got through he had probably spent close to \$3,000.

But for somebody trying to chase the ghost of the *Robert E. Lee* up the broad Mississippi River, outlays like this come under the heading of normal expense.

This July or August, a sunburned Lee Sawyer will probably be out there again, with a two-day beard, bloodshot eyes and a haggard look, trying to make in 40 hours by boat a trip he could make by car in 14. And chances are there will be some other river rats furiously pounding upstream in his wake. END



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surer drive

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- 1 Head can't fly off.
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Handy calculator tells right nail and hammer to use . . . number of nails to a pound. Send 10c to cover handling.

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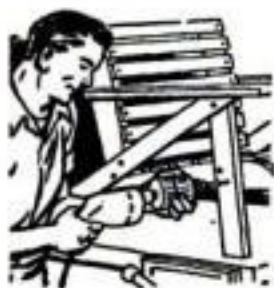
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First time ever! It REVERSES!



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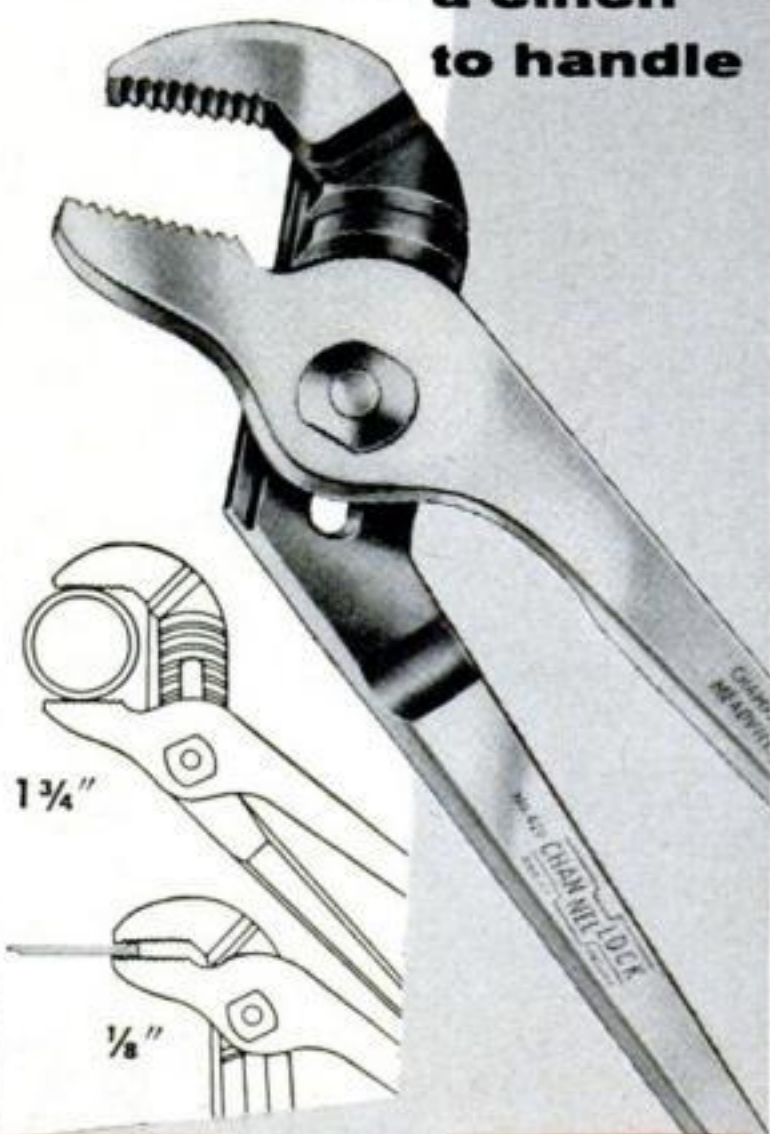
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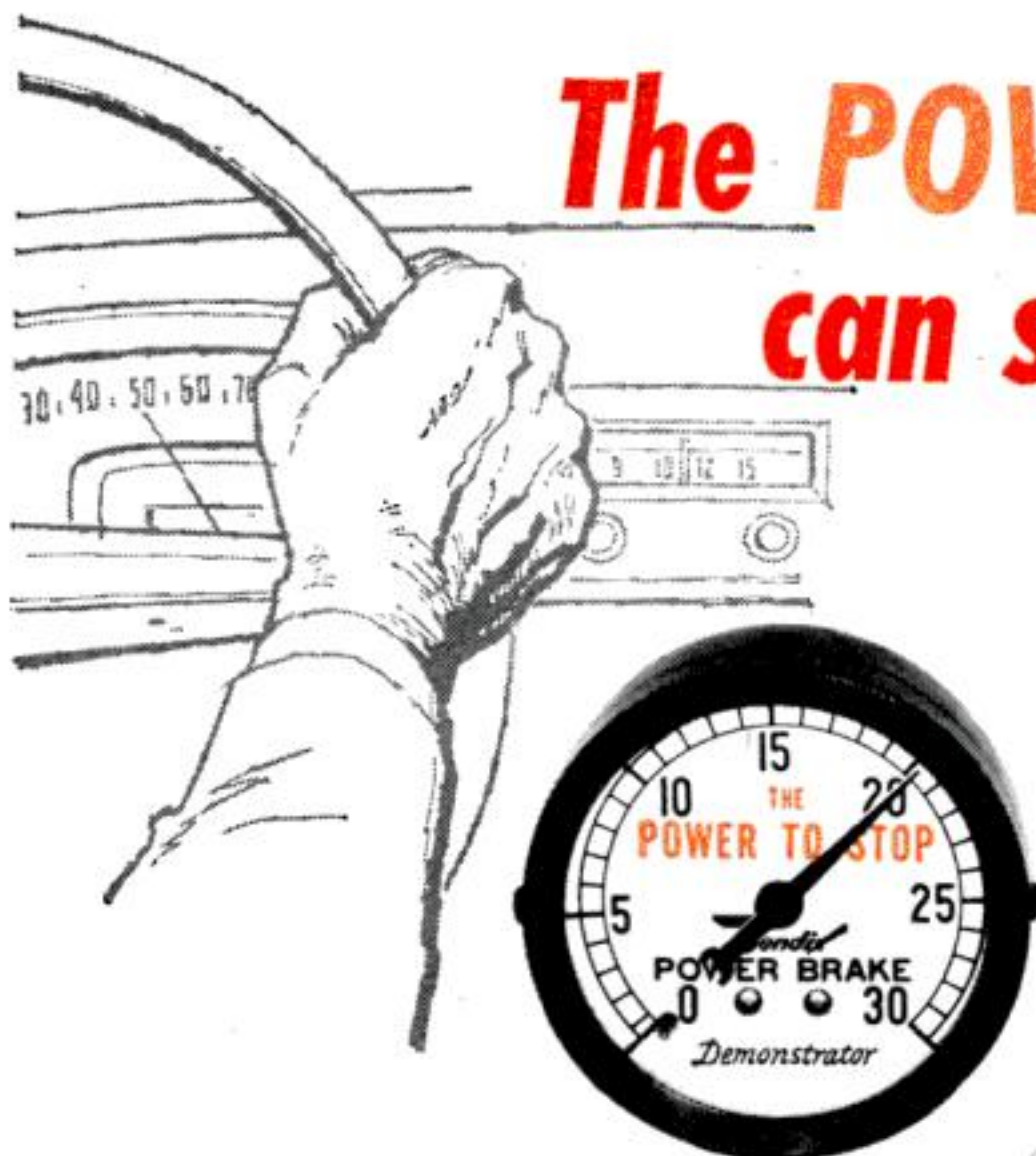
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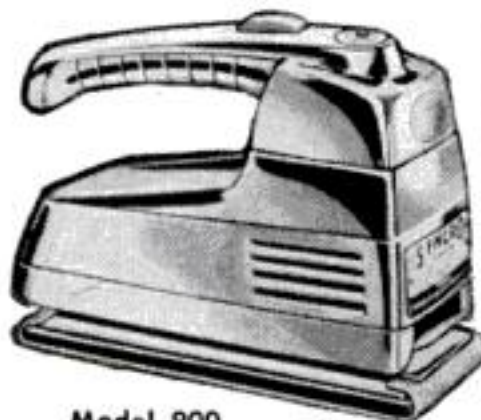
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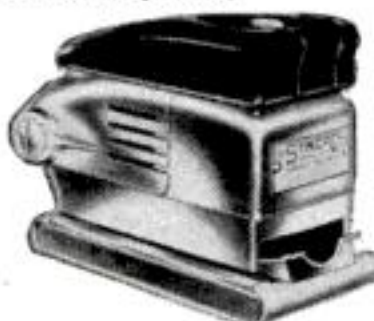
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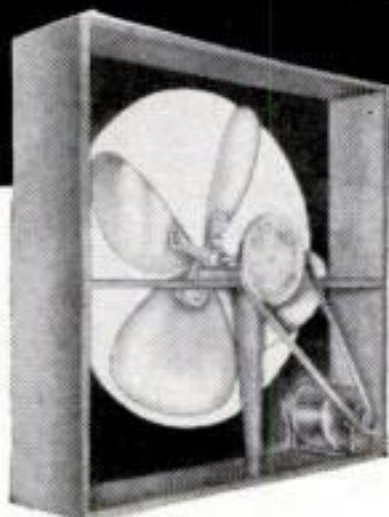
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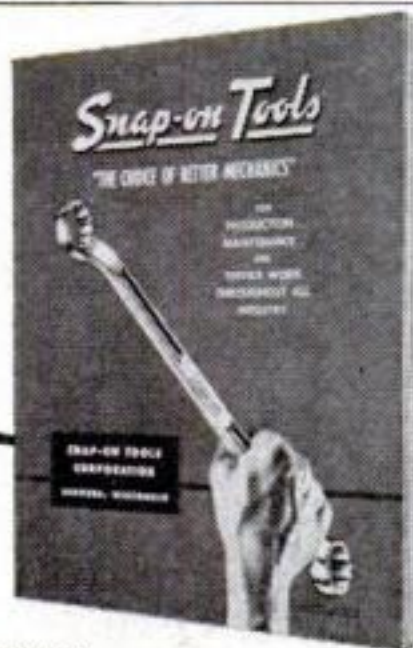
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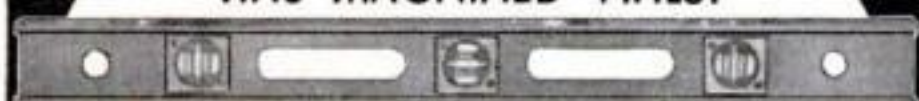
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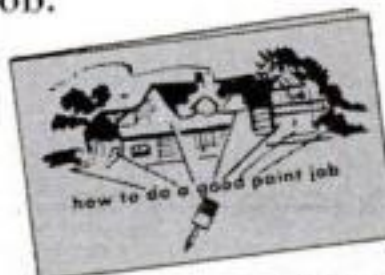
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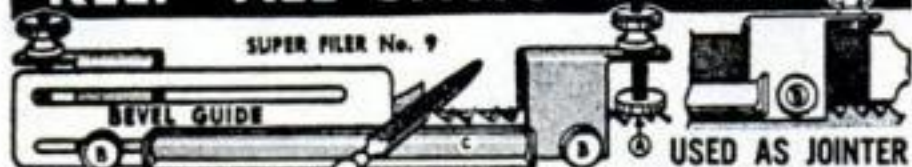
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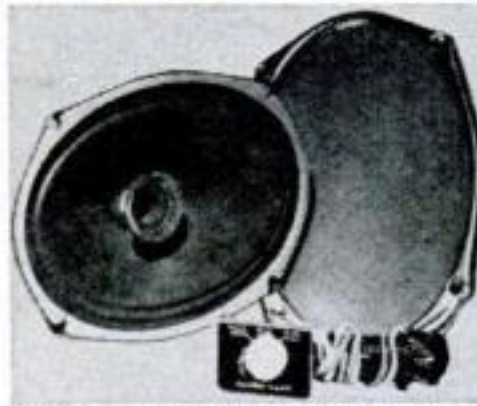
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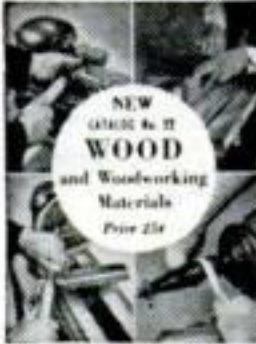
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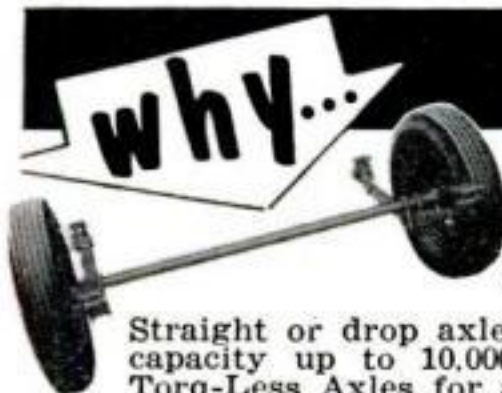
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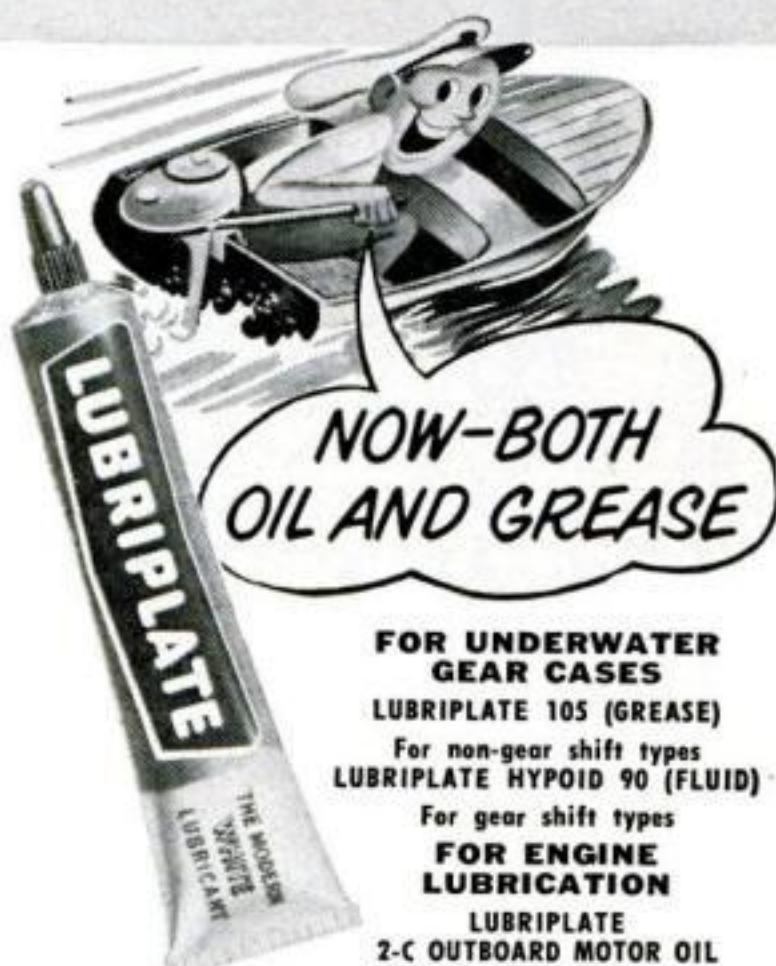


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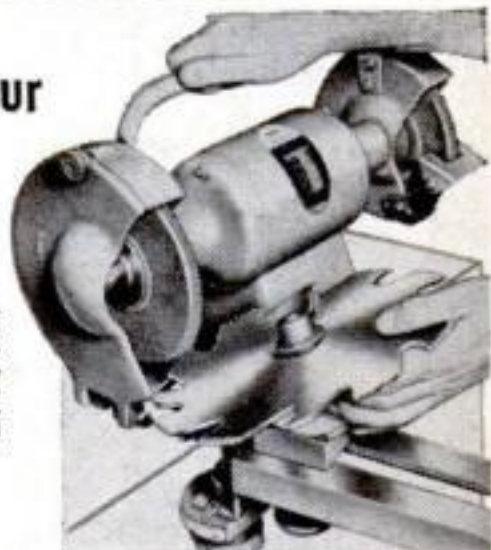
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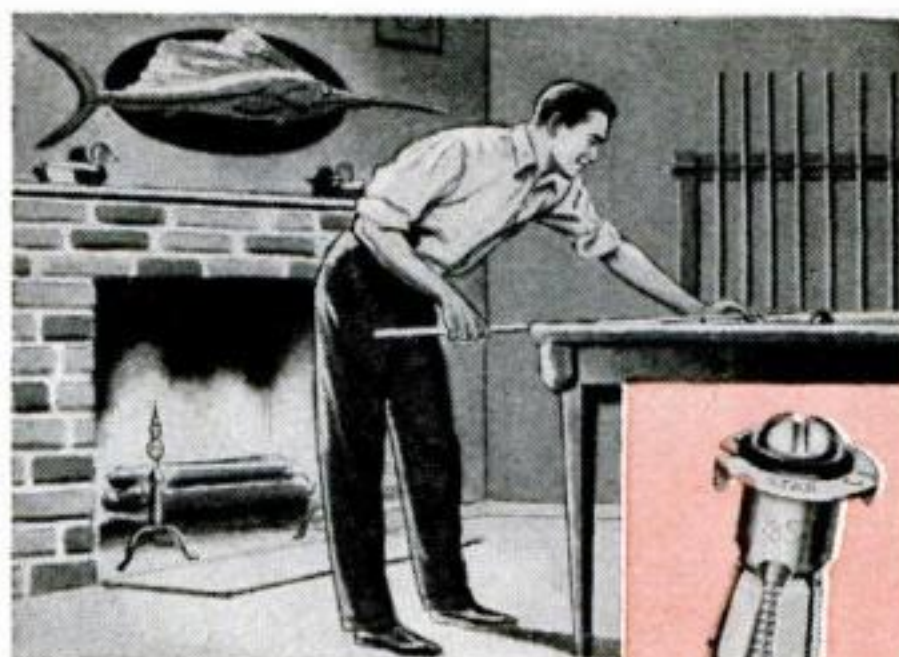
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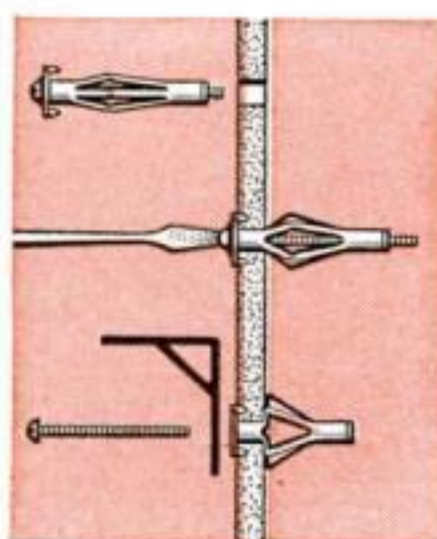
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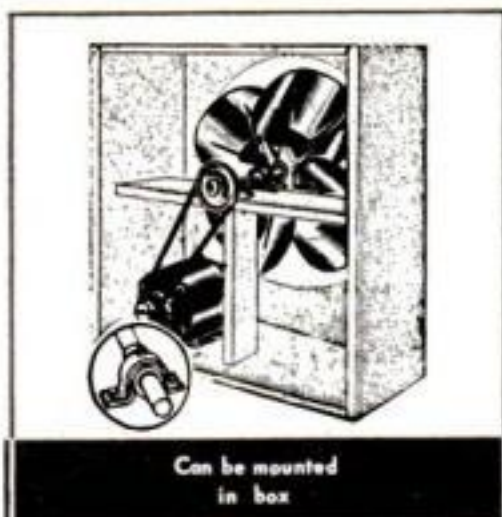
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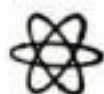
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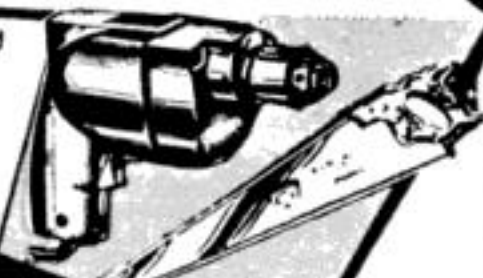
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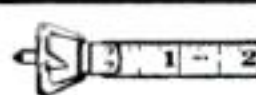
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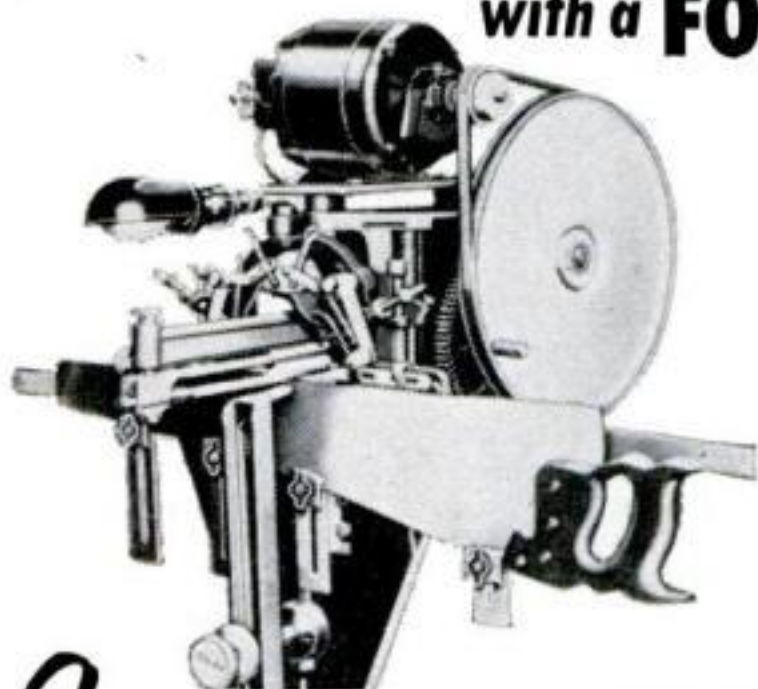
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20 rounds full jacketed ammo included with each rifle purchase. Additional cartridges, \$7.50 per 100 rds. This ammo is for the Russian Moisin 7.62 MM, and also for the Moisin Nagant. We also now have 7.62 MM softnose hunting ammo, 150 gr for deer, bear and No Amer. big game, 20 rds. \$2 95.

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This is the late Russian Model 7.62 MM Moisin Rifle, appr. 30" barrel. Mechanically perfect. Outside: good. Bore: fair. Ballistics: 2820 FPS with 150 grain bullet. Ammunition available everywhere in U.S., an excellent hunting cartridge. Hinged floor plate. Russian ordnance marks on receiver. The Russians won the International Meet in Venezuela (1954) with this model rifle. These guns were confiscated from Communist revolutionaries and placed on the free world market. They are of the type used by Red Chinese in Korea. The sale of these guns in no way aids any country behind the iron curtain. A Once-In-A-Lifetime collector's item. This is the lowest price we have ever seen which would allow a man to equip himself for big game hunting. For C.O.D. Send \$5 deposit. Calif. residents add 4% state tax.

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All-purpose Genuine Bristle Quality Brushes for the Do-It-Yourself painting of Furniture, Walls, Woodwork, for any paint job inside or outside. Set consists of a 1", 2" and 3". Finest quality brushes vulcanized-in-rubber. All 3 actually cost less than you could pay for any one of these brushes elsewhere! Only \$1.29 plus 25c PP. (Only 3 sets to a customer.)

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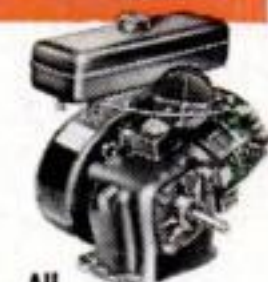
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HEAVY OIL-PUMP BALL BEARINGS
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IRRIGATE, SPRAY, DRAIN OR FILL ANYTHING—ANYWHERE! Will not Rust—Clog—or Leak. Patented Seal. Pumps 2800 gph, 420 gph at 75' high or 1800 gph from 25' well. Six blade impeller. Threaded for pipe. 3/4" inlet, 1/2" outlet. Use 1/8 to 3/4 hp motor. **7500 gph 9.95**
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A private phone or intercom system. Ideal for use on target range, farms, mountains, forest or any place where portable two-way communication is desired. This is the famous EE-8 field phone used to success by the Signal Corps. Gives clear reception up to 15 miles. Uses two standard batteries. Set consists of a ringing generator, one phone, all contained in the original handy carrying case. Several of these phones can be used on one line. Recond. 1750 checked out. Price per ea. phone. 3250

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133 PIECE POWER TOOL ACCESSORY SET - 198

The complete accessory set for any small job. Can be used with any electric drill or grinder. Contains 133 pieces including grind, polish, cut-off & buffing wheels, sanding discs, steel cutters, mandrels, burnisher, mounted stones and knife edge rubber wheels.

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Has four take-off shafts turning at 5, 25, 150 & 4000 RPM. Operates on 110 volt, 60 cycle current. Ideal for home shop, barbeque. 895

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Will stand 2500 PSI. A heavy-duty valve with on ALL Brass body. Closed center, off in neutral. Ideal for use with any fluid. A \$200.00 Value... 3750

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Self-contained, constant torque at all speeds with variable volume, reversible piston pump which supplies piston hydraulic motor. Has 2 H.P. Automatic pressure dash pot for smooth control. Power output RPM—0 to 1/3 input RPM in both directions. Input RPM 1800 continuous, 4000 intermittent. Ideal for Lathes, Dupli-cator setup on Mills, Convey-ors, Small Cars, Drives, etc. 4950

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MADE TO WITHSTAND A CRASH
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Meets Civil Aeronautics Standards. Approved by Police, Safety Councils, Highway Patrol, Fleet Operators, etc. Made of finest NYLON webbing and fitted with Aircraft type buckle. Easily installed in any car. Special sizes for Sports Cars. Available in the following colors: Blue, Green, Gray and Maroon. Don't wait! You May Be Sorry!

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ONLY 489
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SPECIFY COLOR AND ALTERNATE COLOR
5 SECONDS TO FASTEN—1 SECOND TO UNFASTEN

PHILIPPINE MAHOGANY PLYWOOD

For Paneling Dens, Offices, etc. Use in Cabinets, Furniture, etc. Rotary Cut. Both sides sanded. Bonded with finest resin adhesive. Face side unjointed. Shipped at lowest rates.

1/8" x 3 ft. x 6 ft. \$500 VAL. MIN. ORDER 8 SHEETS **179** SHEET
FREE SAMPLE ON REQUEST
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Use it to cover patio, for interior decor, as walls, partitions and many other uses. Ideal for the Home or Office & in new construction. Finest quality, many widths and lengths. Variety of colors. FREE Sample and Booklet. An 85¢ per sq. foot value

3400 RPM—1/2 HP POWER SAW

RIPS - CROSSCUTS
CUTS A FINISHED 2x4 LIKE A KNIFE THROUGH BUTTER

COMPARES TO SAWS SELLING UP TO \$49.50 **1998** Complete with 5-1/2" Blade

A rugged, professional type, adjustable saw. Will cut any angle from 0 to 45°. Has an adjustable (0 to 6") rip fence. Safety-trigger switch on handle. Full 1/2 HP Universal AC-DC, 110-120 Volt, 60 cycle motor. Weighs only 6 1/2 lbs. Thousands already sold. Your satisfaction guaranteed.

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BUILD YOUR OWN DIVING LUNG—SAVE

up to \$100. Our special folder contains complete instructions showing how it's done. Kit includes Air Bottles, Pressure Regulator, Hoses, Safety Belt, Shoulder Harness, Clamps, Mouth Piece, Valves, etc. Price for above kit... **4595** With 2 Bottles (1 hour time) \$150.00 value

CORNELIUS AIR COMPRESSOR

A 3 stage, 1500 PSI air compressor. Has a built-in 1/3 HP, 27 volt, 20 Amp DC motor. Compressor will deliver .4 cubic feet of air per minute. Has a built-in safety valve. Can be adapted to fill underwater diving tanks, spray tanks, for inflating, etc. **NOW 3295**

GENERAL ELECTRIC AIR COMPRESSOR

A 2 stage AC or DC type compressor. Develops 1000 PSI. Has a 1/3 HP, 27 Volt, series wound motor. Ideal for spraying, inflating, painting, etc. **2295**

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G-1 Type. Stainless Steel, Rust & shatterproof. Pressure tested up to 400 PSI. Has 1/4" pipe ports. 12"x24" **1295**
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ICC tested for 1800 PSI.
22 cu. ft. capacity, 5" dia., 19" long. **1095**
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AIR HOSE
For use on underwater air mask. Top quality latex. Built-in non-return valves and mouth piece. All NEW!!! **695**

NEW AIR MATTRESS for ALL STATION WAGONS

CONVERT YOUR WAGON TO A FULL SIZE DOUBLE BED

A snug, comfortable, durable air mattress that makes a FULL SIZE Double BED! Made of heavy duty, laminated vinyl plastic with double welded seams. Extremely lightweight. Excellent for camping, sunbathing, etc. The safest way for the kiddies to ride. Available for Nash Rambler, Pontiac, Buick, Ford, Mercury, Plymouth, Chevrolet. Models 1952 - 1956. Specify. **2395**

ARMY SKI TROOPER STEEL FRAME RUCKSACK

895 PLUS 10% FED TAX

Made of extra strong Army Duck. Has adjustable straps and bindings of heavy duty web with leather reinforcing at the strain points. One large main compartment and 3 small ones. Mounted on a special lightweight steel frame. A \$12.95 VALUE

British Army Steel Frame PACK RACK

With fold-up pack shelf. Spec. design \$5.95

CAMP ACCESSORIES

PORTABLE, FOLDING ARMY SHOVEL—With a 20 inch hardwood handle. Blade will fold to form a pick. Ideal for gardening or use in an emergency. **198**

NEW MACHETE 22" Vanadium Steel Blade with a 5" hardwood handle. Comes with rugged belt sheath. **198**

BOLO KNIFE Top quality steel blade, 15" long. Comes with belt sheath. Ideal for clearing brush. **198**

ARMY PICMATOCK Small, easy to use and pack. Has 12" steel head with pick on one side, mattock on other. 16 1/2" hardwood handle. With case. **198**

NEW ARMY CANTEEN and REISSUE CUP and BELT One quart aluminum canteen and cup fit into insulated canvas cover. Your choice of web pistol belt with grommets to hold extra gear or cartridge belt with extra pockets for items... **259**

WATERPROOF ARMY BEDROLL Large 80"x96" heavy duty duck canvas bedroll. Has roomy pockets in each end to hold extra gear. An ideal enclosed ground cloth for a sleeping bag or air mattress. Complete with (3) 8ft. web straps and buckles. A SURPLUS BUY! **595**

NAVY WADE SUITS

Covers the entire body from the neck down. Protects you from mud, water, etc. Originally designed for overboard work by the Navy. Made of heavy duty rubberized canvas with vulcanized seams. Has built-in rubber boots and gloves. Comes in sizes: Small, Medium & Large. \$35.00 Value. **895**

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Ideal for Fishing or Hunting. Made to Gov't specs. Reconditioned and ready-to-use. Supply Limited.

1 MAN **Only 2295**

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COLLAPSIBLE OARS **125 EACH**

Write Today for FREE FOLDER No. C8 on complete line of Camping Equipment.

Order From This Ad. Pay by M.O. or check. 1/2 deposit with C.O.D.'s. All Prices FOB Los Angeles Warehouse

Engine Has Four Pistons, One Cylinder

[Continued from page 104]

The Omega cuts this pounding to one-fifth that figure. This is because all pistons "float" between gas pressures. Every swing of each piston in both directions is a power stroke. And every power stroke is cushioned by a compression stroke. Friction losses, too, are considerably reduced in the cylinder, because there is no side thrust on the pistons from the connecting rods. Crankshaft whip is eliminated.

Bradshaw says that his Omega engine is the first four-cylinder machine to use two-cycle-type valves. One inlet and one exhaust port are cut in the side of the circular cylinder.

That means that poppet valves, with their springs, tappets, push rods and rockers have been discarded.

Only one spark plug, mounted on the cylinder periphery, is needed to fire the Omega. Timing is a pushover—just four breaker points (also on the cylinder), that brush past a fixed point.

Crankcase oil is maintained at an even temperature because it is completely separated from the hot engine. Air cooling is made easy by placing external fins on the split, aluminum cylinder casting. Rotating in an offset housing the cylinder acts like a centrifugal blower. In addition, a

radial fan steps up the draft. It also extracts exhaust gases to reduce back pressure inside the cylinder.

The net result of all of these features is an engine capable of running at speeds of up to 12,000 revolutions a minute without damage to its parts.

Bradshaw, who has built four pioneer

.....

These are days when the average man can get the world to beat a path to his door simply by purchasing a new power mower.

—THE SIDEWALK SUPERINTENDENT

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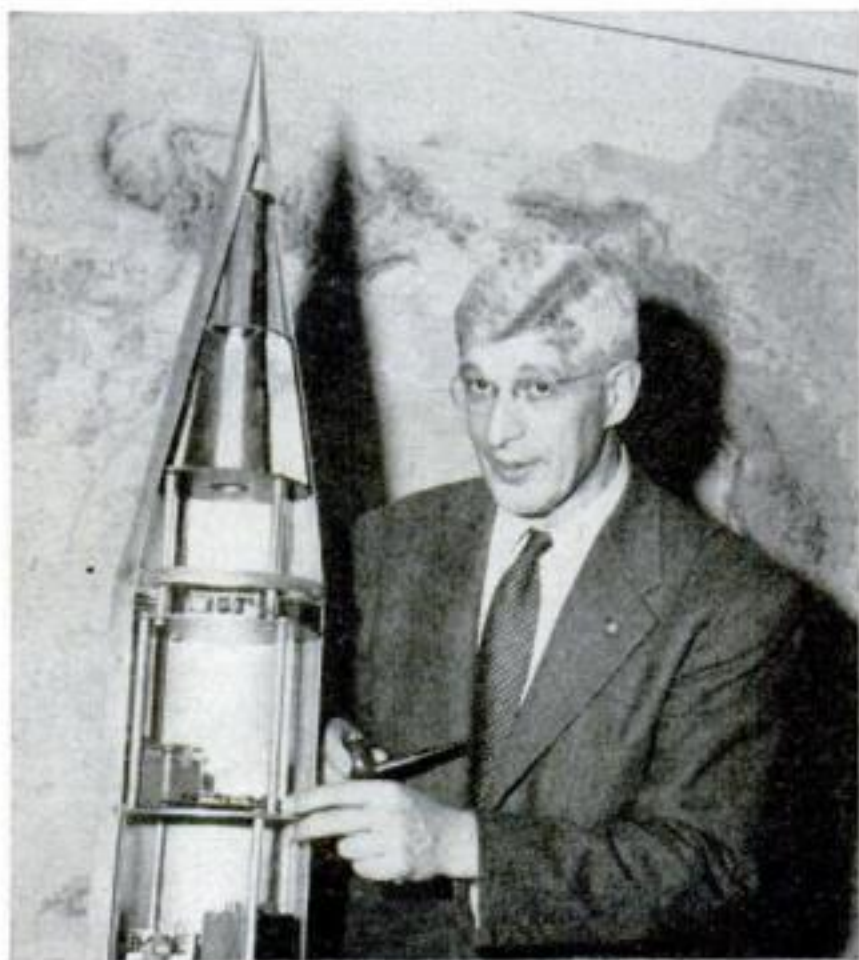
Omegas, is confident that any of them could roll up 200,000 miles before needing major overhaul.

U.S. engineers interested. One of America's "Big Three" motorcar producers is testing one of the pilot models. If there is a soft spot in the doughnut engine, the engineers expect it to show up in the curved pistons. This design prevents the rings from revolving, resulting in unequal wear. Also, there is a flat area on the inside of each piston, where the rocker arm is attached. A break in the curved contour might cause heat distortion and binding. END

.....
NEXT MONTH...

The Joe Who Commands an Army of Scientists

DR JOSEPH KAPLAN, shown looking over a cutaway model of a rocket, is an important man in your future. As chairman of the U.S. committee for the International Geophysical Year, he commands an army of scientists who, a year from now, will launch the greatest assault ever made on the mysteries of the world we live in. Shooting satellites into space is only one of the feats they are planning. For a preview of others—and a close-up of Dr. Kaplan—see PSM for July.



This One



7A4P-F8Q-FX0H

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One torch kit does all three!



It Solders! Small soldering tip and a box of Kester solder lets you fix jewelry, radio, toys, appliances, etc.—also helps with hobbies like model building!



Burns with big flame! Utility burner head gives you big-burning, sootless flame for repairing gutter leaks, laying tile, thawing pipes, lighting fires up to 2300°F. To light, just strike a match and turn a valve... no pumping, no dangerous liquid fuels. Disposable propane gas cylinder lasts for months of normal use, replaces for only \$1.69 at most hardware stores.



Or pinpoints the heat! For fine work, the pencil burner focuses your flame to a narrow point, for antiquing furniture, sweating copper fittings, unfreezing bolts, and other precision operations. All tips are interchangeable on Bernz-O-Matic Torch.



Tackle any job that needs heat!

BERNZ O MATIC®

UTILITY TORCH KIT:



Cylinder, utility burner head, pencil burner, soldering tip, supply of solder... \$10.90 VALUE FOR ONLY

\$7.49



DELUXE ALL-PURPOSE KIT

Tackles anything from soldering to tiling. Flame spreader—burns paint faster. Cutting tip—for cutting linoleum, wood burning. Soldering tip, utility burner head, pencil burner and cylinder are all included to give you the most complete shop torch in a single compact kit! A sensational \$13.15 value for only\$8.88



HANDY SOLDERING KIT...

Also gives other torch uses
Makes your soldering job easy. Cylinder, fine soldering tip and a package of solder let you tackle home, toy, radio, auto repairs. Includes pencil burner unit for silver soldering, putty softening, singeing fowl, etc. Soldering Torch Kit: A big \$8.95 value for only \$6.95

Double your do-it-yourself fun! See these kits—and a demonstration of Bernz-O-Matic instant-lighting torch—at your hardware store. Write for FREE Torch Do-It-Yourself Book!

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For your Ford... always specify the distributor points with the

TRIPLE LIFE!



They're "ventilated"!

Contact surfaces of all Ford points have an exclusive hole-in-the-middle. This lets air surge past contact surfaces while they're operating, keeps deposits from forming, and gives points about *three* times the life!

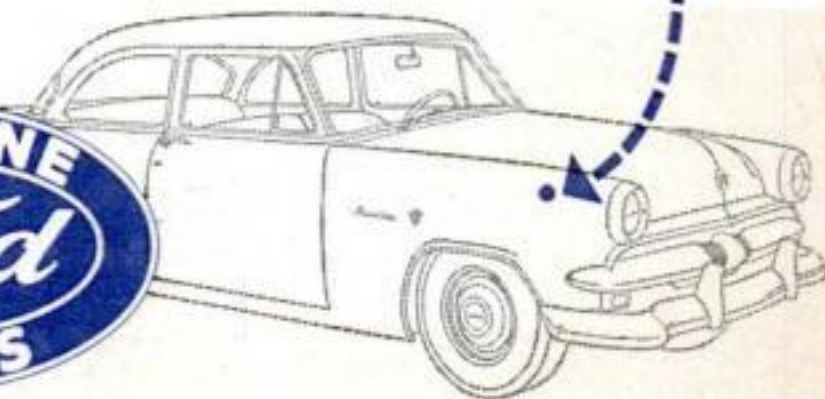
"The unique surfaces of Genuine Ford Distributor Points are self-cleaning," says James Oldham, Ford's Chief Ignition Engineer. "This helps them last up to three times longer than ordinary points."

All Genuine Ford Parts are made right to last longer in your Ford!

Whenever *any* replacement will add to your Ford's performance, always make sure that you specify a Genuine Ford Part, the part that's made to Ford specifications.

For Genuine Ford Parts have to prove they can "take it" in exhaustive Ford track tests, before they're awarded the Genuine Ford label by Ford Engineering. Subjected to as much as fifty times the abuse they would normally get in actual service, you can be sure that they're made right to fit right to last *longer* in your Ford!

Keep your Ford all Ford



SKIPPED ME AGAIN!

I HAD PLENTY OF EXPERIENCE. AND THE BOSS SEEMED TO LIKE ME. I LACKED JUST ONE THING—TRAINING!

I WAS TIRED OF WAITING FOR SOMEBODY TO MAKE UP MY MIND TO ACT! I'D GET THE TRAINING I NEEDED... SOMEHOW! JANE HAD A SUGGESTION...



POOR BURT! HE MISSED OUT ON THAT PROMOTION AGAIN!

SORRY, BURT! I KNOW YOU'VE WORKED HERE LONGER. BUT TED HAS THE SPECIAL TRAINING WE NEED. YOUR CHANCE WILL COME... SOMEDAY!

I CAN'T QUIT MY JOB AND GO BACK TO SCHOOL! AND I SURE DON'T WANT THAT NIGHT CLASS ROUTINE IN THE CITY!



I WAS DETERMINED TO MAKE GOOD IN MY JOB...BUT DETERMINATION, I FOUND, WAS NOT ENOUGH!

JANE SHOWED ME AN I.C.S. ADVERTISEMENT IN POPULAR SCIENCE. THERE WAS THE FAMOUS COUPON. AND THERE WAS EXACTLY THE COURSE I WANTED...

SAY, THEY'LL SEND ME A CAREER KIT FREE... HE NEVER THREE BIG SUCCESS BOOKS. HAVE BEEN MANAGER IF IT WEREN'T FOR I.C.S.



ONE MONTH LATER... THE I.C.S. METHOD MAKES IT EASY! WHAT I LEARN TONIGHT I CAN PUT TO USE ON THE JOB TOMORROW. THIS IS WHAT I CALL REAL LABORATORY TRAINING. IT WORKS RIGHT IN WITH MY JOB!



SIX MONTHS LATER... I KNEW MY BOSS WAS KEEPING TRACK OF MY PROGRESS. THEN ONE MORNING...

BURT, I'VE JUST MADE YOU THE ASSISTANT MANAGER OF YOUR DIVISION...AT \$15 MORE A WEEK. AND THE WAY YOU'RE GOING NOW, THIS IS JUST THE BEGINNING.



GOSH! THANKS, MR. TAYLOR!

I GOT IT, HONEY! I GOT THE PROMOTION! OUR MONEY WORRIES ARE OVER! TODAY'S OUR LUCKY DAY!



WHY NOT MAKE THIS YOUR LUCKY DAY? LET I.C.S. PUT YOU ON THE ROAD TO MORE PAY, RAPID ADVANCEMENT, REAL JOB SECURITY. HERE'S THE FAMOUS COUPON. MAIL IT NOW!

IT'S A PSYCHOLOGICAL FACT: **PLEASURE HELPS YOUR DISPOSITION**



How's your disposition today?

FEEL BADGERED SOMETIMES if things don't add up? That's natural when little annoyances bother you.

But it's a psychological fact: pleasure *helps* your disposition. So everyday pleasures are *important*.

If you're a smoker, choose your cigarette for utmost pleasure. *Choose Camels* —
America's most popular cigarette!

R. J. Reynolds Tobacco Co., Winston-Salem, N. C.



BRIAN KEITH, Star of TV's "Crusader": "I've tried them all. It's Camels for me for good, rich taste, genuine mildness!"



RISE STEVENS, Metropolitan Opera Star: "I choose Camels because they give me so much more pure pleasure out of smoking!"

For
more pure
pleasure...have a
Camel



MARGUERITE HIGGINS, Pulitzer Prize-Winning Correspondent: "No other cigarette gives me the rich taste and real mildness of Camel."



CLAIRE L. CHENNAULT, Major General (Ret.) USAF: "I've smoked Camels over 40 years. They taste so rich, yet smoke so mild!"

**No other cigarette tastes so rich,
yet smokes so mild!**